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EDITORIAL NOTES.

Momentous Hours.

LAST week the country was again kept on the rack by those two uncompromising parties the coal owners and the miners, who have slipped back once more to the old differences of wages and hours; and all that has been done to create a broader outlook and to get the two to work together for the good of the industry and the country has seemingly failed. Initiative and vision are wanted on both sides; but those qualities appear to be lamentably absent. Regarded from the standpoint of last week's abortive work, the nation would be almost justified in thinking that the 23 millions or so which have been found by the taxpayers, and all the generous work of the Coal Commissioners, have "gone west," and have been of no avail. The first move was the publication of the draft of a suggested national agreement by the Central Committee of the Mining Association, with schedules presenting the proposed rates of wages if the existing hours of work are continued, and the rates the owners could pay if there was an extension of hours. In the former case, substantial reductions in the current rates of pay were shown, especially in the exporting areas; but in the latter case, the owners indicated that the extension of hours would enable the payment of higher wages. That the minimum percentage should be on a district basis was one of the tangles in the complicated knot, and the idea that better wage conditions could only be secured through a lengthening of the hours per day or per week was something the Miners' Federation would not contemplate. But without give and take, there is no way out; and a lengthening of hours for a period appears to be the best solution of the problem, seeing that economic facts are as obstinate as either the owners or miners. In fact, they are becoming more hideous and more inflexible by the two sides creating an atmosphere of uncertainty among buyers in other countries, and so making the position easier for rival coal-producing countries to capture our trade. The coal industry, which includes the miners, is making a rod for its own back, the lashes of which will be mightily unpleasant in their incidence.

There were meetings and conferences last week, and much discussion, but no good result. The owners and the miners met, talked for an hour or so, separated—and nothing done, excepting to harden previous respective attitudes. There seemed to be little idea that, reposing in 20 millions and more expenditure, there was an obligation to have some regard to the national interests. The nation has purchased a right to have its interests considered in this matter, and not to have the dispute again reduced to simply one of hours and wages. No real effort was made to remove the barrier between the two parties; and the public became somewhat sickened by reading mere reiterations on the subject of minimum district or national percentages and the resolve of the Miners' Federation not to give way on either wages or hours. The owners at the interview were as adamant as the miners; and the miners would not even discuss the suggested new agreement put before them by the owners, unless as a preliminary they would agree to a national minimum percentage, and not less than the existing minimum. It looked very much as though the miners were playing-up for delay, with the view of reproducing a situation much the same as that which obtained last July, in the hope of getting more in the way of subsidy. That game cannot be played now. A period was defined for subsidy and inquiry; and nothing is to be gained by the owners and miners not tackling the situation as a whole. Meantime, the economic position of the industry is getting distinctly worse, to the advantage of other coal-producing countries. The Premier intervened on Thursday evening, after he had received a deputation from the General Council of the Trades Union Congress, and he there and then agreed to take charge of the negotiations. Conference succeeded conference more or less all day on Friday; but there was no sign of compromise. The only good thing that emerged was that, on the suggestion of the Prime Minister, it was agreed by both sides to appoint a small number of representatives jointly to continue the negotiations under his chairmanship, to endeavour to find a way for removing the present deadlock, which is precisely the spot at which matters were last July.

We are now within a few hours of the time at which the subsidy ends. Those hours are momentous ones for the country. If all that has been done to help the coal industry is unproductive, the shame of it will be upon those who, knowing the needs of the industry through the impartial inquiry by the Royal Commission, have blocked the way, by an unaccommodating policy, to the realization of conditions which would assist the industry to prosperity in a world the circumstances of which have much changed, but with some men in it whose ideas have not been correspondingly re-shaped.

[Too late for comment this week, we have received a highly instructive and constructive address on "Coal and Electricity," by Sir Arthur Duckham, to the Manchester Section of the Society of Chemical Industry. The address, with a report of the discussion upon it, appears on later pages.]

Gas and Electricity Joint Committee.

THE Institution of Electrical Engineers and the National Gas Council have appointed a Joint Committee "to consider whether, in the national interest, an inquiry might advantageously be held into the possibility of closer co-operation between gas and electricity undertakings in promoting capital and fuel economy in the supply to the public of energy derived from coal." The President and four Past-Presidents of the Institution of Electrical Engineers and five members of the National Gas Council constitute the Committee. The Committee, of course, can do nothing that is binding. They can only explore and advise; but it will be good work to ascertain positively whether anything of a beneficial nature can be done through co-operation. Moreover, the investigation will prepare the way, by providing considerations and data, for the development foreshadowed and recommended by the Royal Commission on the Coal Industry. It will be remembered that the Commissioners were strongly of

opinion that there is room for a large and effective co-ordination of work connected with the provision of heat and power for the country which would promote its general efficiency. In their "Summary of Findings and Recommendations," they said: "The heat, power, and "light requirements of the country should be under the "constant and comprehensive survey of a body formed "for the purpose. We propose for consideration the "establishment of a National Fuel and Power Committee, "with advisory powers, composed of representatives "nominated by the Government from the official and "other bodies concerned." The gas and electricity industries are prominently concerned in this recommendation; and it is wise that they should make ready for any development that may come along. A co-operative investigation is only one line of preparation. Both bodies will no doubt also make research into the internal conditions of their own industry. The objective which the Coal Commissioners have in view—the conservation of coal and the co-ordination of the use of fuel—is a matter of national importance. Hence it is right that two such important light, heat, and power industries should have at hand definite information as to what part, if any, they can take in furthering this particular aspiration of the Royal Commission. That information cannot be obtained without united research. Whatever decisions the Joint Committee arrive at, there is this certainty—that the Government, having adopted the Commissioners' report in its entirety, will, at some time, take up the question.

Perhaps the only journal which does not consider this is a politic move on the part of the two professional bodies is the "Electrical Times." Its comment on the subject is an excellent specimen of pure inanity. Our contemporary says: "The I.E.E. was formed for pro-"motion of electrical science in particular; and it is diffi-"cult to see how our century-old gas interests can assist "that object in any shape or form They are impelled by "apprehension they have everything to beg and nothing "to offer. They might, on the other hand, very sensibly "impede progress." There appears to be a semi-colon missing after the word "apprehension," and commonsense throughout the passages. Further on we read: "The present moment is particularly unhappy for any "conversations with our ancient gas interests which have "a hand-to-mouth retail mentality. The great majority "of their engineers are committed to old-fashioned "methods, they have a system which may quite possibly "become derelict in a few decades, the whole problem "of gas generation and transmission is in the melting "pot." Our contemporary appears to have overlooked the Government electricity scheme, and the reason the Government think it necessary. The "Electrical Times" should not have allowed its peevishness to betray such colossal ignorance in these matters. But it has done so, and therefore must bear the invited ridicule. Its criticism also suggests a superior intelligence over this matter to that possessed by five men who have been considered worthy of election to the Presidency of the Institution of Electrical Engineers, and five members of the National Gas Council. We will not waste time, or insult the intelligence of our gas and electrical engineering readers, by submitting the evidence which shows the crass absurdity in the editorial paragraphs in question. We may suggest, however, that if our contemporary wishes to make a further exposure of its knowledge in the same direction, it should dilate on the words: "The great majority of their en-"gineers are committed to old-fashioned methods"—defining first "great majority" and then describing "old-fashioned methods," and state the extent of their use in proportion to the total gas supply of the country. We should like to learn something more as to the breadth and depth of the knowledge of the "Electrical Times" on these matters. However, that paper may rest assured that nonsense such as that to which it has given publicity will have as much effect on the trend of development as a mouse would have in trying to overthrow one of the pyramids of Egypt. Nothing may come of the joint inquiry; something may come of it. Who knows? And nobody would know by sitting closeted in a room in Sardinia House, Kingsway, and engaging in silly fulminations such as those quoted above.

Meter Prices and Quality—A Suggestion.

The question of cut prices for meters, through the competition which is going on among the makers, is one which has a deeper significance for the gas industry than the mere matter of initial payment for a certain article. What is proceeding now must, if persisted in, have a detrimental result, inasmuch as if, through price cutting, the meter manufacturers are unable to make a fair profit, there are, it seems to us, only two courses for them to take—either to close down, when they cannot longer combat the pressure, or to produce meters of inferior material and workmanship, which would not be to the interest of the gas-supply industry. Either course would be repugnant to the makers; but we cannot see how the latter one is to be avoided if the present state of affairs continues. Should that come to pass, then the lower quality meter would inevitably be more costly in the long-run than good quality at a fair initial price. Seeing how greatly the gas supply industry is concerned in this matter, and the makers having found it impossible among themselves to arrive at a solution of the difficult problem before them, we commend to the attention of the industry a thoughtful, suggestive letter from Mr. R. G. Shadbolt, which appears in our "Correspondence" columns to-day. When a "deadlock" occurs in an industrial dispute, it is usual nowadays for someone to intervene, to see whether something cannot be done to bring about a settlement. The gas-supply industry being so deeply interested in this matter through the possible effects of the continuance of price-cutting, Mr. Shadbolt suggests, for the consideration of the industry and the makers, that the time is ripe for the former, through one of the central organizations, to intervene, and see whether from the existing impasse a way out cannot be found. With this in view, he suggests matters which require determination. One thing must be assured, and that is the protection of meter quality; and such assurance cannot unite with unprofitable manufacture. Our "Correspondence" columns are open to support or discussion of Mr. Shadbolt's suggestion; and we hope the meter makers will not be averse to expressing their views. Anyway, we earnestly commend the letter to the attention of the Central Executive Board of the National Gas Council, because there is a matter here which deeply concerns the buyers of meters.

Gas Charges and Sales Development.

The minutes published last week of the Central Executive Board of the National Gas Council indicated that the Committee appointed to consider the various factors which should be taken into account in framing a scale of differential prices for gas had received a report from their small expert Accountant Sub-Committee, and that this is being carefully considered This concise announcement shows three things: First, that the Central Executive Board very properly regard the matter as one of importance to the gas industry; secondly, that the view exists that the present methods of charging do not afford sufficient latitude having regard to outlook and competition; and, thirdly, that the investigation is proceeding on sound scientific lines, by taking counsel with financial experts, so that nothing may be recommended which has not complete justification. That the gas industry requires more liberty in the matter of charges is perfectly obvious, not only on the ground of what our competitors are doing, but in order to permit of the industry doing its destined part in providing heat for domestic purposes and heat and power for industry. In present circumstances, in the homes of the mass of the people, it would be impossible to adopt gas for the general heating of rooms; where the household exchequer is of limited order, gas cannot be employed constantly, but only intermittently, through the days and weeks of winter—that is, at present flat-rate prices per therm, though in some districts the price per therm stretches ability to a greater length than in others where the therm charge is higher. The domestic consumption, it seems to us, requires to be dealt with on one basis, and the industrial on another, because of the differences in the incidence of the main loads—room heating being a seven or eight month requirement at all hours, and according to the prevailing atmospheric tempera-

tures; the industrial being a day demand all the year round, and in large volume through one service and meter, instead of being split-up as in domestic supply into a large number of small units, each with its service pipe, meter, and all the work appertaining thereto. The limiting barriers to progress also want breaking down. If a revision of the methods of charging will enable this to be done, so much the better for our future, and the future is inviting the industry to alter its ways in more than this one respect.

The importance of the subject being recognized, and the fact that present methods of charging do not afford sufficient elasticity being admitted, we shall all await with unusual interest the report of the Special Committee appointed by the Central Executive Board. There is a great responsibility on the Committee, because the problem they are attacking refers to a traditional practice of the gas industry, and yet it is a problem the solution of which is necessary to improve the competitive position of the industry, and to open up the avenues which will lead to larger progress, while helping to provide what is wanted in manufacture and domestic service—a labour-saving and a non-smoke-producing fuel. Furthermore, any fundamental change in our charging practice would necessitate statutory authorization, and probably modification of existing enactments. It must not be overlooked, however, that this, like other changes to which we have been referring in articles over some months now, has, in the present—in view of the Coal Commission's report, the parliamentary proceedings in connection with electricity, and the Smoke Abatement Bill—an opportunity of gaining parliamentary ratification which may not in the time to come be present in such fullness. It is worth a big effort to revise our parliamentary enactments and obtain new authorization now.

Speaking of what is going on in the electricity industry, it may not be generally known (although it has been mentioned on previous occasions) that the Electricity Commissioners have authority to empower any system of charge which, in their opinion, would be of advantage to the electricity industry—thus making departure from the old parliamentary definitions as to charges which have hitherto appeared in the schedules to Private Electricity Acts and Orders. The form of departure is usually to the two-part method, the advantages of which have been often pointed out. The main ones are that the primary charge covers all the fixed costs of supply to every consumer, and the secondary charge the cost of producing and transmitting electricity to the consumer, with a profit attached. The first charge ensures that every consumer pays his proportion of the capital and establishment charges; and the second, being a low price per unit, encourages use for any purpose while necessitating only a single service and meter. We are inclined to think that the system originated in the gas industry; seeing that the "standard requirements" or "two-part" scale of charges was introduced by Mr. W. B. McLusky, of Halifax, in 1905. We know that some of the American methods of charging for gas are based on principles very similar to those adopted at Halifax. In this connection it is well to keep in touch with what is being successfully done in America in this regard, combined with the advanced service there to the consumer, and clever advertising and salesmanship. We fancy there will be no denial of the claim that the pioneer work of Mr. McLusky has had an influence not only in America, but in the electricity industry here. But it is the electricity and not the gas industry that is speeding ahead with the application of this plan of charging to the work of sales development. We have to counter that. How? We shall look for the answer in the report of the Special Committee of the National Gas Council.

There is another point—the charge to the large industrial consumer through one service and meter. Constant day consumption in big volume is a financial advantage of no mean order to both gas and electricity undertakings. It is day consumption all the year round which both industries require. In our "Electricity Supply Memoranda" this week, a tabulated statement will be found in the paragraph side-headed "Value of Large Consumers." That table is worth very careful study by gas men generally, and particularly by the Special Committee of the National Gas Council. It shows the economic advantage to an undertaking of the large consumer compared with a large number of small ones—the authority for the data being Mr. S. E. Fedden, the Chief Engineer of the Sheffield Corporation Electricity Department. The comparison is between 593 consumers, taking in the aggregate 477,560 KW.-H., with a load factor of 10·9 p.ct., and one large consumer taking 1,200,000 KW.-H., with a load factor of 27·4 p.ct. The capital charges and distribution expenses make the difference between a total cost of 4·45d. per KW.-H. to supply the 593 small consumers and 1·01d. per KW.-H. for supplying the single large consumer. This illustrates what can be done in supplying electricity at a cheaper rate to one large customer than to nearly 600 small ones. The gas industry has never properly considered this matter. It has, in defence of flat rates and a small discount to large volume consumers, been said that it is unfair to supply these at a materially lower price than small consumers; but it is becoming manifest that the rejection of large consumption at a low price—a price at which it can be profitably sold through the smaller charges involved by it—is an injury to the small consumers, if it means a loss of custom.

We cannot hope that the Special Committee of the National Gas Council will be able, in connection with this question of charges, to do more than define general principles and make recommendations. It will then be for each undertaking to explore its own conditions, to ascertain the extent to which it can go in the application of a system of charging to counter the movements of the competitor in this direction, and to induce large consumption by domestic consumers; also to realize what is the actual ability in tempting, through price, considerable industrial custom.

A Strike Against Discipline.

A STORY of a singular strike comes from Glasgow. Strikes, as a rule, are based on some fundamental question—such as wages, hours, or other conditions of employment, or to settle some issue bearing upon a principle. But to strike because certain men have been discharged who have been found guilty of a want of discipline, a breach of trust, and stealing time which represents labour due to those who pay them, is carrying striking to a very foolish extreme. Of all men in the service of a large gas undertaking, those employed on the district should have a high sense of duty and responsibility, seeing that their actions cannot be in all cases, and constantly, under the direct surveillance of an inspector or foreman. This very fact should make every conscientious man desirous of justifying the trust reposed in him. This has not been the spirit animating certain fitters employed by the Glasgow Corporation Gas Department; and because they did not heed warnings and a posted notice, but persisted in practices which were opposed to discipline and honourable conduct, they were dismissed. In order to secure their reinstatement, other fitters went out on strike, and so caused further dislocation to the work, and therefore damage to the Department which gave them employment. To put the story briefly, what happened was that it was learned that shops belonging to private plumbers in all parts of the area of supply were being made use of by Corporation gas-fitters for illegitimate purposes. It was discovered that surplus piping which had been handed out for jobs was left at the shops, instead of being returned to store, and cards were marked to the effect that the material had been used. The same shops were used by the men for meal purposes. To that there could be no objection; but time was frittered away in them for other purposes than meals. It was found that men visited the shops on their way to and from a job, and the time spent in them was entered on their cards as having been devoted to the job. Notwithstanding this pilfering of time and mishandling of Corporation property, the General Manager (Mr. John W. McLusky) took the lenient course of warning the men through the inspectors that these practices must cease; but this had no effect. In consequence a notice was posted last November forbidding the men to use plumbers' shops for any purpose whatever, and stating that any men disregarding this would be liable to instant dismissal. Even that was not a sufficient deterrent; and it was found

necessary to dismiss half-a-dozen of the fitters. This course was justifiable from all points of view—the General Manager would have been failing in his duty to the Department and to the ratepayers, had he not taken it; and what was done has been confirmed by a Special Committee who have been investigating the occurrences which led up to the dismissals. Then came the strike to secure reinstatement; but before this took place, Mr. McLusky intimated that he would consider the question of reinstating the men. But the fitters apparently preferred trying to make reinstatement compulsory; hence the strike. However, the Special Committee, after a scrupulously careful inquiry, fully confirmed Mr. McLusky's action, and left the question of reinstatement in his hands. There could be no serious defence of what the men had done; and for the Special Committee to have arrived at any other decision would have been detrimental to discipline in public service. We hope that the Glasgow men will now "make good," and show they are as capable as others of having and keeping a clean sheet for honest work. On the whole, in the gas industry, the district men are of a good type, render excellent service, and take a pride in the reputation of the concern in whose service they are. The negation of this testimony is rarely found.

The Electricity Bill.

Last week little was done in connection with the Government Electricity Bill; but the matter was kept alive by occasional references in the papers. The Standing Committee of the House of Commons to which the measure was referred began their sittings yesterday; and a good deal of skill in attack and defence will now be expended. To the Committee some 35 members have been added, including representatives of industrial districts, and certain of the Conservative members who criticized the Government proposals during the debate on second reading. Sir Robert Sanders is the Chairman of the Committee; and the piloting of the measure through this troublesome stage has been entrusted to the Attorney-General (Sir Douglas Hogg), the Minister of Transport (Lt.-Col. Wilfrid Ashley), and the Parliamentary Secretary to the Ministry (Lt.-Col. Moore-Brabazon). Several more amendments have been tabled.

It is noticed that various Chambers of Commerce have been discussing the measure; and it is clear that, in the majority of cases, little confidence exists that the proposals of the Government will do anything to reduce the costs of electrical energy delivered, or those of manufacture generally. It is believed that the contrary is more likely to be the effect of the scheme. A point which has been prominent in the discussions is that, even among laymen in electrical matters, the scheme presents itself as having a distinct socialistic tendency; and it is felt that the contemplated Government interference is totally unwarranted. While the Government fail to see they are by the measure advancing the scheme of the Communists for the nationalization of industries, it is obvious to business men constituting Chambers of Commerce that the methods proposed will at any rate create a precedent which is a material step towards the undesirable goal. The Government may be, or pretend to be, blind to this; but our industrial magnates have not allowed their eyes to escape a very imposing fact. Nor have the Labour-Socialists. Mr. Ramsay MacDonald is reported to have said: "The Electricity Bill will be found to be, not only "for itself, but for its beginnings and effects, one of "the most substantial advances in the direction of "Socialism. And I laugh and laugh every time I see a "Tory supporting it." And the extremists are prowling about where workers assemble, and are telling them that the coal trouble is the opening of the final conflict between Capitalism and Socialism!

Another interesting contribution to the controversy aroused by the Government plans has relation to what has been done in America. The protagonists of the scheme have had much to say about the backwardness of this country in electricity consumption per head of the population in comparison with the United States. Whether or not that is so, the fact remains that the development in electricity supply which has been made in the States has not been by a process such as the Government and their advisers have designed. The developments in America have been entirely by private enterprise, and not through that control and regulation of generation and distribution as is now proposed for this country. We are a little afraid that a speech made by Mr. Samuel Insull, of Chicago, at a luncheon given last week in his honour by the American Chamber of Commerce (in London), will be misleading to those who have no knowledge of the differences in the position of electricity supply in America and the reorganization contemplated here. Mr. Insull has large interests in the electrical undertakings of America. He spoke of the millions of tons of coal which have been saved through the concentration of electricity generation there; but those saved millions of tons are due to the fact that, in the beginning of electricity supply in the United States, there was unregulated competition in many areas, which has all been changed to district generation and distribution. Naturally, where such unregulated competition prevailed, waste was inevitable; and the elimination of that waste has contributed largely to fuel economy. No one denies that within limits generation concentration is an excellent thing; but to deal with concentration on a national basis, with enormous lengths of unprofitable transmission lines, is a totally different proposition. Despite, however, the concentration to which Mr. Insull referred, there are in the United States 4800 generating stations, or 41·5 per million of inhabitants; while in this country we have 584 authorized stations and 30 non-statutory ones, or only 14·1 per million of inhabitants. This statement is taken from the "Electrical Review;" and further information on the subject is given in the first paragraph of our "Electricity Supply Memoranda" this week, together with data as to the relative consumptions per head of population in the United States and this country. The new light which is thrown on this matter shows that the comparisons hitherto made have not been devoid of exaggeration.

Slot Meters and Hire Purchase.

An interesting letter has been received from Mr. Ernest Hardiker, of Smethwick, on the subject of our editorial, under the above heading, in last week's issue. The letter will be found in the "Correspondence" columns to-day. From it, it will be seen that for some time past the Smethwick Gas Department have been encouraging consumers to purchase cookers and fires on hire-purchase terms by the aid of slot meters. The practice is to have the meters set in excess of the normal price of gas; and they are emptied monthly. The balance beyond the amount required to pay for the gas consumed is handed to the consumer, who from it pays to the collector the instalment due for the appliances under purchase. The system has been found of mutual benefit to consumers and Department alike; and Mr. Hardiker considers that this is an excellent method of promoting appliance sales.

Maximum Weeks.

Every year since 1921-2, the Birmingham Corporation Gas Department has established a new record in a maximum week's consumption. In 1921-2, the maximum week demanded 274,896,000 c.ft. of gas; during the week ending Dec. 5 last, the output was 362,585,000 c.ft. In consequence of the large expansion of business, the Department are very busy with plant modernization; but it is anticipated that the new Washwood Heath Works will have to be put in hand in 1928-9.

Smoke Abatement Bill.

The House of Lords on Thursday went into Committee on the Public Health (Smoke Abatement) Bill. But no practical amendment was made in it, such as the gas industry as a supplier of smokeless fuels would like to see. It is true that an effort was made to introduce extension in the direction of domestic chimneys. Earl De La Warr moved an amendment to the effect that local authorities, on submitting proposals under the Housing Acts, should satisfy the Ministry of Health that proper arrangements were being made to prevent or reduce emission of smoke from the chimneys. His Lordship

was unsuccessful. The Government intend to resist any movement in this direction. This was clear from a remark by the Marquis of Salisbury, who appears to be still living in the past, and thinks it is no part of the duty of the Government to bring about scientific heating in this country, and a reduction of the contribution made by the domestic chimney to atmospheric pollution with all its evils. His remark was that it was the practice of the British people to have open fires in their homes, and any provision which would put an end to that practice would be resented in a manner which it would be very difficult to resist. It may be the practice, but it is a bad one; and, in view of all that it entails in the way of destruction of health and property, the duty of the Government is obvious.

Safeguarding of Industries Act.

The report of the Committee on the Safeguarding of Industries Act, 1921, was issued as a White Paper last Thursday. It contains some important observations on the working of the Act, and recommends the continuance of, and in some instances additions to, the present duties. Among the recommendations, it is noticed that, in the case of the compounds of thorium, cerium, and other rare earth metals, synthetic organic chemicals, analytical reagents, and fine chemicals, the existing duty should be continued. It is also proposed that the tribunal prescribed by section 1 (5) of the Act should be strengthened, and that the period for which the safeguarding duties are continued should be a minimum of five, and preferably ten, years. The Chancellor of the Exchequer, in his Budget speech on Monday, stated that the Key Industries duties would be continued for ten years.

Companies as Voters.

Intermittently there is a revival of the question of the peculiar position of companies in relation to voting in respect of local government. Notwithstanding that the tendency of industry and trade is towards joint-stock enterprise, and that there has been immense development in this direction, also that joint-stock companies are immense ratepayers, they are still without a vote. Gas companies particularly, since municipalities have taken to trading in electricity, have felt the need of the possession of the ordinary rights of ratepayers. Last week the Home Secretary received a deputation from the London Chamber of Commerce and the London Municipal Society regarding the extension of the local franchise to companies and joint-stock corporations. In support of the appeal, it was stated that in 1907 60 p.ct. of the rateable value of the city was unrepresented on the register of voters, and that, in the whole of Lombard Street, only eighteen persons were entitled to vote. Naturally the Home Secretary could not commit the Cabinet to any course of procedure in this connection; but he promised to lay the subject before his colleagues. Personally, he hoped that the Cabinet would favour the principle of the Bill on the subject which has been introduced by Lt.-Col. Vaughan-Morgan, and is down for second reading in the House on May 7.

Benzole as a Motor Fuel in Germany.

In Germany, a scientific study is made of developing as far as possible the home production of all commodities, with the view of reducing imports to the greatest extent. A little discomfort is being felt there at present owing to the growth of motor traffic having been at a rate in excess of the increase in the production of benzole. Since the war the yield of petroleum in the Hanover fields, and the considerable developments of benzole production, account for the substantial proportion of home-produced motor fuel consumed in that country. Benzole as a motor fuel has also permitted the employment of high-compression motor engines, for which imported petroleum fuel is not satisfactory. The "Petroleum Times" has printed a translation of an article from the "Deutsche Bergwerks Zeitung," in which reference is made to the extensive scale on which the production of benzole has been developed. It is stated that until recently the use of benzine was almost entirely replaced by benzole, due partly to the fact that imported motor fuel had declined in quality through the inclusion of higher boiling-point fractions; while the quality of benzole had been steadily improved as the result of scientific research by the industry—the Benzole Syndicate having established a technical and scientific department for this purpose.

The Present Position.

It is calculated that, of the total benzole production of Germany, about 80 p.ct. is used for motor spirit; the remainder being employed in the dyeing industry and for extracting and solvent purposes. The fact that benzole production did not keep step with the demand for motor fuel is apparently due to the reduced demand for coke. In view of this, the Syndicate have for some time been marketing a benzole-benzine mixture, under the name of "Aral," which is said to be little (if any) inferior to pure benzole, and is quite suitable for use in high-compression engines. In recent years in Germany, the price of benzole has steadily increased, until to-day a kilo is from 20 to 25 p.ct. dearer than a kilo of benzine; and if the specific weight is taken as the basis, benzole is about 40 p.ct. dearer than benzine. The difference in price is due in part to the lower boiling-point of benzole. The mean boiling-point of German motor benzole is 98°, while the mean boiling-point of petroleum motor fuel is about 130°. Moreover, benzole gives better service, and does not produce "knock." From this information, it will be gathered that in Germany benzole is the favoured motor fuel—the imported spirit being only used to make up the deficiency in its supply.

Fuel Position in America.

An interesting report has been made by the American Institute of Mining and Metallurgical Engineers on the four principal fuels used in the United States. Regarded from the percentage point of view, the use is as follows: Bituminous coal, 73 p.ct.; anthracite, 11·5 p.ct.; fuel oil, 10·3 p.ct.; and natural gas, 5·2 p.ct. Data which the Institute have collected indicate that the peak in the use of natural gas and fuel oil is about reached, and that a reduction in these fuels should be expected in the future. Foreseen is a change back to coal as a fuel by many industries, owing to the gradual failure of the natural gas supply and the increase in the cost and reduced supply of oil fuel, due to the future great demands for petrol and lubricating oil.

PERSONAL.

We are asked to announce that Mr. Andrew Scott, who specializes in plants for the incineration of town refuse, and deriving power therefrom, has closed down his offices at 39, Victoria Street, Westminster, and joined the staff of the Woodall-Duckham Companies, in which capacity he will be occupied in the development of their new refuse destructor, the first of which has been installed for the Marylebone Borough Council, and is now about to undergo its initial tests.

OBITUARY.

We regret to have to record the death of Dr. John Bell Simpson, which occurred, at the age of 88 years, at his residence, Bradley Hall, Wylam-on-Tyne. Deceased, who was a well-known Durham and Northumberland coal owner and mining engineer, was formerly head of the Stella Coal Company, and a pioneer of the Aged Miners' Home movement. He was a Director of a number of companies, including the Sunderland Gas Company—on the Board of which he had been for a number of years.

By the death of Mr. W. Anderson, which, as mentioned in last week's "Journal," occurred abroad on April 8, the Imperial Continental Gas Association have lost another link with their pre-war stations. Mr. Anderson joined the Association as Pupil Engineer at Hanover in 1878, and remained at that station during the whole of his career as a Gas Engineer. He was promoted to the position of Assistant Engineer in 1883, and appointed Chief Engineer in May, 1908, on the retirement of Mr. Leonard Koerting. The construction of the new Linden Gas-Works, near Hanover, which was completed in 1913, was carried out under his superintendence. As, on the outbreak of war, the Hanover Gas-Works were sequestrated by the German Government, and subsequently handed over to the town of Hanover, the Imperial Continental Gas Association could no longer make use of Mr. Anderson's services; and he was therefore placed on the retired list. After the conclusion of hostilities, Mr. Anderson returned to Hanover in the capacity of British Vice-Consul. He will be much missed by all who had the privilege of knowing him.

PRINCESS MARY AT THE GAS EXHIBIT AT OLYMPIA.

H.R.H. Princess Mary visited the exhibit of the Gas Light and Coke Company at the International Building Trades Exhibition last Friday afternoon, and showed much interest in the new refrigerator operated by gas at a cost of only 1d. per seven hours, and also in the economy gas flue, which reduces the cost of building by over £5 per room. Her Royal Highness—who is a very practical student of domestic science—expressed keen interest when told that this new plan has saved £100,000 at Liverpool, where the Corporation have installed 20,000 gas-fires under their housing schemes. She smilingly agreed that there would also be an enormous saving in household drudgery as a result of the use of these labour-saving fires.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

April 29.—Midland Junior Gas Association.—Annual general meeting at Birmingham.
April 30.—"B.C.G.A.," Scottish Conference.—Perth.
May 5.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, under the presidency of the Rt. Hon. Sir Alfred Mond, Bart., M.P.
May 6.—Eastern Counties Gas Managers' Association.—Spring meeting at Ipswich.
May 6.—Midland Association of Gas Engineers and Managers.—Spring general meeting at Dudley.
May 6-7.—Refractory Materials Section of the Ceramic Society.—Meeting at Newquay.
May 6-7.—Iron and Steel Institute.—Annual meeting at Institution of Civil Engineers.
May 7.—North of England Gas Managers' Association.—Annual general meeting in the County Hotel, Newcastle-upon-Tyne, at 2.30.
May 7.—Chemical Engineering Group of the Society of Chemical Industry.—Annual general meeting at the Florence Restaurant, Rupert Street, W. 1, at 6.30.
May 7.—London and Southern District Junior Gas Association.—Annual general meeting at the Westminster Technical Institute.
May 8.—Manchester and District Junior Gas Association.—Visit to the Blackburn Gas-Works.
May 11.—Federation of Gas Employers.—Meeting.
May 11.—National Gas Council.—Meeting.
May 13.—Murdoch Lodge, No. 3480.—Meeting.
May 13.—Faraday Society.—General discussion on explosive reactions in gaseous media, at the Institution of Mechanical Engineers.
May 14.—Southern Association of Gas Engineers and Managers.—Visit to Bristol.
May 14.—"B.C.G.A.," Manchester District Conference.—Buxton.
May 18.—"B.C.G.A.," Cheshire and North Wales District Conference.—Wallasey.
June 1.—National Gas Council.—Annual general meeting.
July 19.—Institution of Chemical Engineers.—Annual meeting.
Sept. 9.—"B.C.G.A.," Midlands District Conference.—Smethwick.

Institution of Gas Engineers.

May 11.—Advisory Committee on Education.
May 12.—Benevolent Fund, Finance Committee, Emergency Committee.
May 19.—Gas Investigation Committee.
June 7.—Council.
June 8-10.—Annual Meeting.
June 11.—Visit to Hastings.

"New Books."—Sir Isaac Pitman & Sons, Ltd., have published their spring list of new books, which will be of interest to many of our readers.

Midland Junior Gas Association.—The annual general meeting of the Association will be held at Birmingham to-morrow. At the conclusion of the business portion of the meeting, Mr. C. Elliott, B.Sc., Hon. Secretary of the Smoke Abatement League of Great Britain, will give a short lecture on "Smoke Abatement."

North of England Gas Managers' Association.—Mr. W. W. Atley (the President) will take the chair at the annual meeting of the Association in the County Hotel, Newcastle-on-Tyne, on Friday, May 7, at 2.30. Two papers will be read—one by Mr. H. E. Copp, of Hull, on "Competition with Electricity," and the other by Mr. A. E. Ruffhead, of Darlington, on "Graphs."

ELECTRICITY SUPPLY MEMORANDA.

The "Electrical Review" has been doing a good service by examining the authenticity of some of the data which have been freely scattered about to depreciate the development of electricity supply here in comparison with other countries. The United States, with its vastly different conditions, has had prominent mention in the propaganda. If the statistics which have been published by the "Review" are innocent of error, then they convict the Electricity Commissioners and their political supporters of either careless investigation, or negligence in not verifying the figures they have quoted. For the United States, the average consumption per head of the population has been quoted here as 500 KW.-H.; and that of this country at 117 KW.-H. The first thing that strikes us about the data (published by our contemporary on the authority of the "Electrical World" for Jan. 2 last) is that the superior consumption position in the United States has not been attained by the consolidation of generation in the manner proposed in this country. In the States there are 6000 light and power systems, with 17,937,160 customers. The population being about 116 millions, there are nearly 52 undertakings per million of population. In this country, there are 565 authorized undertakings, and perhaps 30 unauthorized—a total of 595. The population being 43½ millions, this country has only 13·7 undertakings per million, or in round figures 38 less. It will be noticed that the term "systems" has been used above. Those "systems" are supplied by 4800 generating stations, or 41·5 per million inhabitants; while here we have 584 authorized stations, and (say) 30 non-statutory ones, or only 14·1 stations per million of population, or 37·4 less. Thus the *per capita* consumption has not been secured in the States by the process politically contemplated in this country; there, in fact, the 500 KW.-H. goal of the Weir Committee and the Electricity Commissioners has been reached by the very opposite to the procedure suggested here. This is a point that has not been touched upon by the promoters of the Government scheme. Then it is found that the central station output in the United States in 1925 was 59,517 million KW.-H. *generated*, or 514 KW.-H. per head; but the energy *consumed* was 47,997 million KW.-H., or 414 KW.-H. per head. But at the time the Weir report was drafted, in which 500 KW.-H. is given as the average consumption, the latest figures obtainable were those for 1924—viz., 54,413 million KW.-H. generated, and 43,892 million KW.-H. consumed. The then population was 114 millions, so that the energy generated was 477 KW.-H. per head, and consumed 385 KW.-H. In view of these figures, which brings 385 KW.-H. into comparison with the 117 KW.-H. in this country, it would appear that someone has been palming off generation figures as representing consumption in the United States. But this does not complete the discrepancy revelations. The "Review" states that Sir John Snell, in his evidence before the Coal Commission, gave an estimate of the output of private plants in this country, which raised the average consumption per head from 117 KW.-H. to 220 KW.-H. The number of private power plants in the United States last year is known—8157, with an output of 12,000 million KW.-H. Ignoring distribution losses (which are small from private plants), we get the respective total consumptions for the United States—central stations and private plants combined—as 490 KW.-H. per head, as compared with the 220 KW.-H. in this country, which is a different state of affairs from the 500 and 117 respectively as representing the position of central station supply in the United States and this country. Then, again, one-third of the whole output in the United States is derived from water power. In its concluding remarks, our contemporary says that the cost of distribution to large industries is relatively a minor factor; in the case of domestic consumers, it is by far the largest item, and may reach 90 p.ct. of the total when rural supply is in question. The truth will out, if not in the House of Commons.

Challenged Consumptions.

Wrecking Confidence.

When a big and drastic reorganization scheme is contemplated such as that now before the electrical industry, which proposes to usurp rights and powers granted by Parliament, the paramount consideration should be the gaining of the confidence of the industry concerned in the plans being fundamentally right and fully justified. But there has been no attempt at doing this. There has, on the contrary, been a callous, roughshod ride over the industry throughout the piece; and the industry is not satisfied. The more the case is examined, the greater is the growth of discontent, and of required explanation. The foregoing paragraph gives an instance of misstated consumption; and there are many other questions which need elucidation. One to which we have previously called attention is the £33,500,000 of stock which the Government Bill proposes to authorize the Central Electricity Board to raise. A layman might be pardoned for imagining this is the total expenditure

that will be necessitated by the scheme. But the Weir Report hustles any such idea out of mind. In that document, it is remarked: "The technical scheme will, we think, involve during the next fifteen years new money to the extent of £250,000,000." What is really the total estimated expenditure the industry will have to bear as a direct consequence of this scheme, nobody knows, and so nobody can tell. Confidence is shattered by matters of this sort, together with the large growth of the mechanism of officialdom and control, with dictation rampant, and a lovely complication of generating, selling, buying, reselling, and so on as the Board direct and their lordships the Electricity Commissioners confirm. It is all delightfully grotesque. The Premier spoke of the Central Board being like the Mersey Docks and Harbour Board or the Port of London Authority. Neither of those bodies has to report, or go to another body and say: "Please gentlemen, have we your approval to do this?" or "May we do that?" And they have no superbody—a section of a Government Department—who have to report to that Department what they have done, or what they are doing. Yet Cabinet Ministers say to the electricity industry: "Gentlemen, you are totally mistaken. What we propose is not bureaucratic control; and we cannot think what made you imagine it was." Every industry in the country ought to combine to oppose this innovation in Government control of industry—an innovation not warranted by circumstances.

The Stepped Control.

When the Bill is being discussed by the Standing Committee, a strong attack will be made against the controlling and directing powers of the Central Board, and against the super-authority of the Electricity Commissioners, who are not beloved in all quarters of the electrical industry. But the Commissioners have deeply embedded themselves in the affections of the Government and the Ministry of Transport; and they no doubt feel they have a palladium which offers them ample security. However, it is generally conceded that, Parliament having given second reading to the Bill, in some shape or other it will go through. Hence the feeling that it is better for all opponents to concentrate on the making of very drastic modifications in its provisions. Sir Philip Dawson, M.P., recommends that the Bill should be amended to provide that the Central Board should be composed of the best business talent the country possesses—men commanding the respect of all, and entirely independent of any political or bureaucratic control. Should conflict arise regarding any decision they may arrive at, it should be settled by an impartial judicial tribunal. This last condition is one which the gas industry particularly desires to see brought about. Sir Philip also suggests that the Bill should be modified so that the rights of those who have invested money in the electricity supply industry shall not be interfered with. Further, that private enterprise should be encouraged by all possible means, and that, while the consumer is properly protected, there should be an inducement to the producer to improve the methods of generation and distribution by enabling him to participate in the financial benefits resulting therefrom. So far there can be unqualified approval of Sir Philip's suggestion. He further proposes, however, that the Board should be given compulsory powers to carry overhead transmission lines across country, and generally to facilitate the spread of electrical enterprise. We hope that overhead transmission lines will be reduced to the absolute minimum.

Economy Wins.

The Kingston-on-Thames Corporation have, we learn from the "Surrey Comet," lost probably their best customer. The emporium of Bentall's, Ltd., is far-famed; and for power and lighting in their workshops, showrooms, and shopping departments, they have been using between 140,000 and 150,000 units a year, the average price for which has been between 3½d. and 4d. per unit. The custom has meant a cheque of upwards of £2000 for the Electricity Department per annum, and the bill was increasing. Now Bentall's possess a generating station of their own. Mr. Leonard H. Bentall states that the step was taken on the ground of economy—the climax in the decision to make the change being reached when the Corporation refused to grant a minor concession. He estimates that his Company will save about £750 per annum, making full allowance for capital charges, depreciation, repairs, fuel, labour, and accessories, and have the supply under their own control, and be less liable to breakdowns. He told the Electricity Committee that he could by installing his own plant produce electricity for 2½d. per unit. Their disbelief led them to assert it was impossible. They are wiser men to-day. He is doing it for less than 2¼d. The experience so far has produced some extraordinarily interesting and economical figures. Moreover, there has been a reorganization of work, which gives the plant a fairly regular load. Oil-engines are used; and the heat of the exhaust gases is applied to steam-raising, which contributes another economy. Mr. Bentall describes the installation as a magnificent success. Our only regret is that gas-engines were not used instead of oil-engines. Then the Company would not have had the trouble of purchasing oil, and having it delivered; and two 2000-gallon tanks would not have been required for storing it. Oil-engines at the best are messy things. However, so satisfactory is the experience from the economic point of view that Mr. Bentall says he is willing to show the plant to any friends of the Company who may be interested. There is no doubt he is proud of the change he has made.

Value of Large Consumers.

In the "Memoranda" for March 10, reference was made to an article by Mr. J. Rutherford Blaikie, which had appeared in the "Electrician," and in which it was shown that the size of an electricity undertaking has no relation *per se* to the cost per KW.-H. to the consumer; and he showed the value of large consumers to an undertaking. This is a matter in which gas suppliers in industrial areas are very interested, in view of the fact that it is necessary that full credit shall be given to large consumption in respect of the savings in cost, in order that the lowest price possible, consistent with an advantage to the concern, shall be charged to industry so as to get from it as great a heating and power load as possible. Mr. Blaikie has now contributed a second article to our contemporary, in which he enters more fully into the question of the factors which apply in determining the price at which it is possible to take large industrial consumption. He points out that the two principal factors which determine the cost are the size of the consumer and the load factor, though the load factor may to a certain extent determine the size of the consumer. To obtain some idea of the relative importance of these two factors, he refers to data in a paper which Mr. S. E. Fedden, the Chief Engineer of the Sheffield Corporation Electricity Department, read some time since before the Institution of Electrical Engineers. The figures are so instructive that we are sure the author and our contemporary will not object to their reproduction here. They are:

1. Capital cost of generating plant per KW. £13
2. Capital cost, mains, services, and meters for 593 consumers demanding 500 KW. £30,035
3. Capital cost, mains, service, and meter for one consumer demanding 500 KW. (deduced) £3,457
4. Distribution, management, and rates per consumer . £6 1s. 6d.
5. Cost of generation per KW.-H. . . . . 0·81d.
6. KW.-H. supplied 593 consumers . . . 477,560 L.F. 10·9 p.ct.
   KW.-H. supplied 1 consumer . . . . 1,200,000 L.F. 27·4 p.ct.

	Case 1. 593 Consumers.		Case 2. 1 Consumer.
500 KW. at £13 per KW.	£6,500	..	£6500
Mains, services, &c.	£30,035	..	£3457
Total capital	£36,535	..	£9957
10 p.ct. interest and redemption	£3,653	..	£996
Distribution, &c., at £6 1s. 6d. per consumer	£3,602	..	6
KW.-H. at 0·81d.	£1,600	..	£4050
Total cost	£8,855	..	£5052
Cost per KW.-H.	4·45d.	..	1·01d.

For interest, Mr. Blaikie sees what happens if he gives in each case the small consumer's load factor of 10·9 p.ct., instead of 27·4 p.ct. for the large consumer.

Capital charges and distribution, &c. . . . KW.-H. at 0·81d.	As before	..	£1002 £1600
Total			£2602
Cost per KW.-H	4·45d.	..	1·31d.

Reversing the load factors, the following is obtained:

Capital charges and distribution, &c. . . . KW.-H. at 0·81d.	£7,255 £4,050	..	As before
Total	£11,305		
Cost per KW.-H.	2·66d.	..	1·01d.

NOTE.—Income-tax charge is omitted for the sake of simplicity.

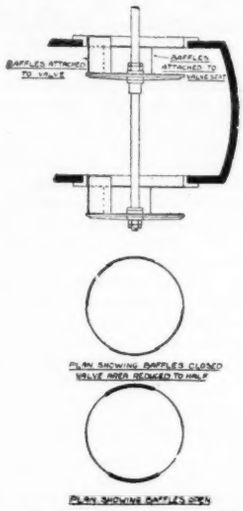
It will be seen from this compilation that less cost is involved in supplying large consumers at 27·4 p.ct. load factor than 593 small consumers at 10·9 p.ct. load factor. The author also notes how differently an increase of load factor affects the two examples. In the case of the 593 consumers, if the load factor is raised from 10·9 to 27·4 p.ct., the cost is reduced from 4·45d. to 2·66d., or about half, whereas with the one large consumer the same alteration in load factor reduces the cost from 1·31d. to 1·01d., or 24 p.ct. As Mr. Blaikie says, this shows that the size of the consumer is the principal factor in determining the cost of the supply. The data and the deduction are peculiarly interesting in connection with the consideration of the problems regarding consumers' charges which are engaging the attention of the gas industry.

SELF-LOADING STATION GOVERNOR.

Peebles New Automatic Apparatus.

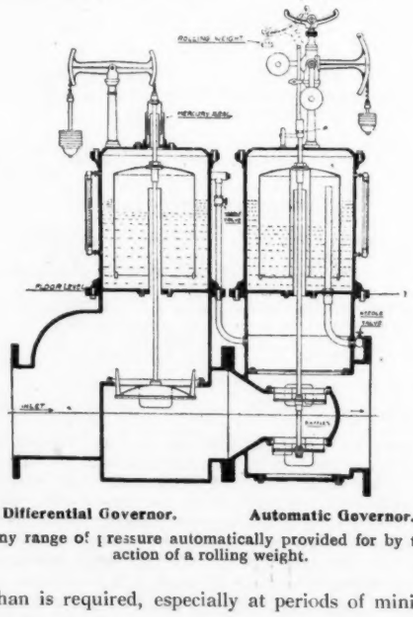
The aim of every distribution department is to supply all consumers with gas at an adequate and constant pressure. In small areas, where mains and services are large enough easily to cope with the demand, this condition can be fairly obtained by keeping a constant pressure at the works; but as the areas supplied by gas undertakings are extended, and existing mains are lengthened, and as consumption increases, the pressure loss is more acutely felt. This situation can only be met by increasing the pressure at the source of supply.

Following upon this increased pressure at the works, individual, service, or district governing is adopted. Theoretically, of course, individual governing is best, but the cost to the consumer of having a governor at each appliance, and the


BAFFLES ATTACHED TO VALVE
BAFFLES ATTACHED TO VALVE SEAT
PLAN SHOWING BAFFLES CLOSED VALVE AREA REDUCED TO HALF
PLAN SHOWING BAFFLES OPEN

Arrangements of Baffles on Valves of Automatic Governor to meet conditions of large and small output as in summer or winter, and yet keep full range of outlet pressure.

care required to keep these clean and in good working order, militate against the adoption of this system. Service governing is simpler, for the gas to the premises is then only controlled at the meter or, in large buildings, on (say) the different floors. The third method—that of district governing—controls the pressure to certain defined areas, and is in the hands of the distribution engineer. These three systems presuppose that the pressure from the works is sufficiently high at all times to maintain these governors in action. This pressure is often



Differential Governor. Automatic Governor.

Any range of pressure automatically provided for by the action of a rolling weight.

higher than is required, especially at periods of minimum demand.

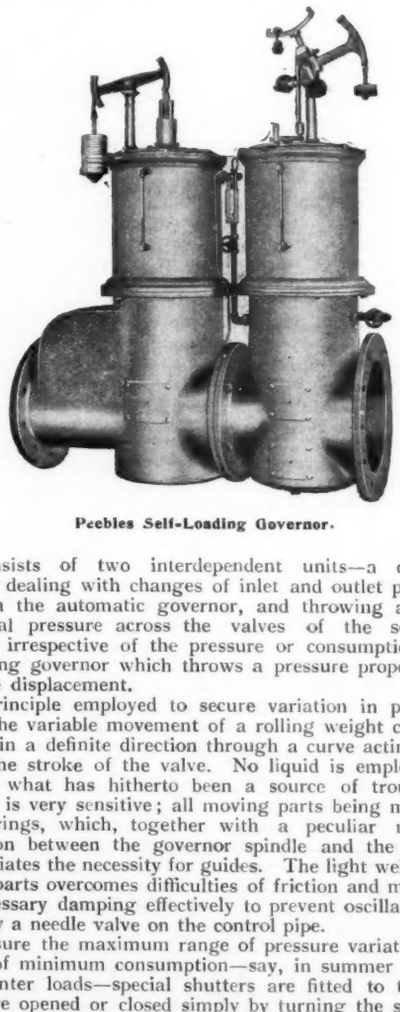
There is a fourth method of dealing with the difficulty. The idea of this is to make the pressure thrown by the station governor depend upon the volume of the gas passing through it at any time. Such a governor must be automatic in action. It must be capable of throwing any pressure required between fairly wide limits. It should be loaded to maintain the best average pressure; this to be determined by taking pressure charts from representative localities.

Imagine a town in which the gas consumption has exceeded that for which the mains were intended; these mains being fed from one source of supply. Suppose there is a point in the system where the pressure must at no time be less than 3 in., and that to maintain this pressure during periods of maximum demand it is necessary to have a pressure of 5 in. at the source of supply. With an ordinary station governor throwing a constant pressure, this would mean a 5 in. pressure during the whole 24 hours. On the other hand, an automatic self-loading governor set to throw 3 in. to 5 in. as the load varied from minimum to maximum would give the necessary pressure at all times. As a result, the average pressures throughout the district would be better. Moreover, with such a system, measurement of the gas by the meters would be more accurate.

As another example, take two holders feeding the mains from extreme ends. Should one holder fail, the pressure in the immediate vicinity would be bound to drop if the other source was supplying at constant pressure. If, however, there was a self-loading governor at the latter source, the increased load resulting from the failure of the other holder would at once cause it to throw more pressure, and thus avoid the heavy drop in the neighbourhood of the grounded holder.

Peebles Self-Loading Governor.

This is designed to meet the foregoing and similar contingencies. It is a proportional governor, and can thus be used in combination with a recording pressure chart as an inferential meter giving the instantaneous send-out of gas, or, by integration, the total output over a period.



Peebles Self-Loading Governor.

It consists of two interdependent units—a differential governor dealing with changes of inlet and outlet pressure to and from the automatic governor, and throwing a constant differential pressure across the valves of the self-loading governor irrespective of the pressure or consumption, and a self-loading governor which throws a pressure proportional to the valve displacement.

The principle employed to secure variation in pressure is that of the variable movement of a rolling weight constrained to move in a definite direction through a curve acting in relation to the stroke of the valve. No liquid is employed, thus avoiding what has hitherto been a source of trouble. The governor is very sensitive; all moving parts being mounted in ball bearings, which, together with a peculiar method of suspension between the governor spindle and the automatic arm, obviates the necessity for guides. The light weight of the moving parts overcomes difficulties of friction and momentum. The necessary damping effectively to prevent oscillation is obtained by a needle valve on the control pipe.

To ensure the maximum range of pressure variation during periods of minimum consumption—say, in summer as distinct from winter loads—special shutters are fitted to the valves, which are opened or closed simply by turning the spindle. It is interesting to mention that a 20-in. governor actually in use, the maximum capacity of which is 4½ million c.ft., is at times being employed for a total send-out of 250,000 c.ft. That this is possible while still retaining the self-loading action is a remarkable testimony to the design and workmanship of Peebles self-loading station governor.

COAL AND ELECTRICITY.

An Address to the Manchester Section of the Society of Chemical Industry, on Friday, April 23.

By Sir Arthur Duckham, K.C.B., M.Inst.C.E.

I have chosen coal and electricity as the subjects of my address to-night, as they are to the fore in the minds of all industrialists, as well as in the world of politics. We may be faced with a national catastrophe on May 1, should the parties to the coal dispute not reach agreement; we may be yoked to a great national experiment in electrification, if the Electricity Bill passes Parliament without considerable amendment. On coal depends the industrial prosperity of this country; electricity is a means by which the energy latent in the coal is translated into active force for the operation of our mines, yards, factories, and workshops.

We have before us the report of the Royal Commission of 1925. This report has fulfilled a definite purpose. It is agreed by all sides that it is impartial, and at the same time the most comprehensive presentation of the real state of affairs in the coal industry that has ever been advanced. The purpose of the report is rather to make the facts clear than to propose any drastic solutions to the present difficulties. In certain cases the way is indicated; but action is left to the parties concerned. The Electricity Bill has passed its second reading, and will pass into law unless the unforeseen occurs.

Definite and immediate action has to be taken in both these matters. They are vital to the industrial and domestic life of the country, and to no class more vital than to the chemical industry. It is our duty, therefore, to do what lies in our power to assist in the proper solution of the problems—not by destructive or prejudicial criticisms, but by helpful suggestions and the promotion of goodwill.

COAL.

The Human Element.

It would appear that the present impasse is the culminating crisis of a series extending over the last fifteen years. In this industry two-thirds of the selling price of the product coal is represented by payment for manual labour, leaving one-third to pay all other charges—such as pit props, and other consumable stores, &c., rents, rates, taxes, staff salaries, Directors' fees, all the manifold expenses of the undertaking, and finally profits. It must be apparent to all that in this industry, beyond all others, prosperity depends on the close co-operation and the harmonious relationship of all concerned. When we look back over the years of disputes, the bitter speeches from both sides, the fomenting of ill-feeling by ill-advised and unbalanced protagonists, is it to be wondered that, when met by this world-wide post-war crisis, the industry fails to come through, and shows itself practically bankrupt? Just consider that in 1900 270 tons of coal were raised per man; while in 1924, after a quarter-of-a-century of improvement in machinery and labour-saving devices, only 220 tons of coal were raised per man employed. Although we may criticize, it is not for us to blame. Both the Mineowners' Association and the Miners' Federation must feel that the end of the tether has been reached; that the days of bargaining and playing for position are past. There can be only one interest for both sides—the present saving and the future prosperity of the coal industry.

Genuine attempts have been made to harmonize the interests in the industry—such as by profit sharing. To-day 87 p.ct. of the money received for the coal, less costs of production other than wages, is taken as labour's share. At the same time certain standard minimum wages are guaranteed by the employer. The drawback to this scheme was that it was introduced during bad times, and so no considerable benefits have accrued to the worker, and he has not felt the natural incentive to greater effort.

Enough has been said to show that the solution to the present trouble is co-operation. A lock-out or strike would bring no settlement; it would mean dislocation of the life of the country, further Government intervention, the resumption of conferences, and probably a further call on the taxpayer.

Over-Production.

In order to indicate the present position as to demand, I cannot do better than quote four clauses from the Commission's report (p. 222):

(1) Compared with the pre-war period, the home demand for coal is stationary. Economies in the methods of burning coal, combined with depression in the iron and steel and shipbuilding trades, have counterbalanced the effects of growth of population and of industrial progress.

(2) The foreign demand was 7½ p.ct. less in 1924 than in 1909-13. In 1925 it was 22 p.ct. less. There has been in 1925 a serious depression in the industry in almost all the coal-producing countries of Europe. The principal causes are: The depressed condition of a number of staple industries in many parts of the Continent, and the almost complete cessation in the demand for imported coal in Russia; the increased use of oil for shipping; the large increase in the output of lignite in Germany; and the working of new or extended coalfields in certain Continental countries.

(3) A great new coalfield has been developed in South Yorkshire and Nottinghamshire. From this field about 11 million tons a year are now being produced; and before long the production will be 20 million tons.

(4) With a stationary demand at home and a reduced demand abroad, the number of men employed in the coal mines of Great Britain has increased from an average of 1,048,000 in 1909-13 to 1,156,000 in 1925, or by more than 10 p.ct.

The conclusion to be drawn from these statements is obvious—especially when they are taken in conjunction with the fact that for the quarter ending December, 1925, the average cost of production for the whole of the coal raised in this country was 1s. 6d. per ton less than the average price realized. A large number of the collieries are unremunerative; and economic pressure will drive them out of production. The losses made in these pits have depressed the level of wages in the various districts; and owners have been driven to sell coal at unremunerative rates to keep the pits working, thus increasing the difficulty of operating the more prosperous collieries.

Hard times cannot be surmounted without hardship and sacrifice. Owners will have to face monetary losses; and there will be a temporary increase in unemployment. It is not to be taken that the coal in these pits will be lost to the country. Improved demand and improved methods may justify re-opening; adjacent collieries or fresh sinkings may be able to operate more cheaply. But the country should not be called on to directly support unprofitable concerns by means of subsidies.

Wages and Hours.

These two questions form the chief debating points of the numerous conferences being held at the present time. The settlement must be made between the two parties concerned; and no outside interference is at all possible. To those who are conversant with the wages conditions of the industry, or who have studied the Commission's report, two facts are apparent:

(1) That the miner is not overpaid.

(2) That his wages do not compare favourably with those in other trades, in which the work is less arduous and far less dangerous.

In many districts, when no profits are forthcoming, only a subsistence wage is being earned, varying from 41s. 6d. to 52s. 6d. a week; whereas shift working for labourers comes out at between 45s. (pithead men) and 52s. (underground men) a week. The pay of men in sheltered trades is considerably in excess of this. Take corporation employees, with wages varying from 49s. to 62s. a week. We all realize the hardship of accepting a reduction in wages, when the money already coming in is not more than sufficient to support life decently. We also know how unsatisfactory it is from a national point of view to depress the standard of living. To my mind a reduction of wages should not be pressed for, but greater production. I am certain that the miner would rather work half-an-hour per shift longer at the same wages than work the present hours for 10 p.ct. less wages. The half-hour longer per shift would put the British miner on the same basis as his fellow workers on the Continent, who are our chief competitors for the export market.

I have always been in favour of Pit Committees. Co-operation must grow up from the bottom, not down from the top. Much could be done in such Committees to increase the amount of coal raised per man-shift, and for the extension of piece-work rates to cover all men from the actual coal cutter to the pithead worker. It is only by putting all concerned on a mutual basis that real economies can be made. Further, with a proper spirit ruling in the Pit Committee, many suggestions could be made and discussed from both sides which would be beneficial to the working, and also promote a feeling of interest and responsibility in all classes of workers concerned in the winning of the coal.

After reading those 32 pages of closely printed matter in the Commission's report on wages, one must wonder how the miner ever gets his wages at all, and when he gets them how he checks them up to be correct. Some simplification of rates would seem essential; and I believe much harm is done by continuous reference to back years and obsolete conditions. Such references must increase argument, and make settlements more difficult. It is agreed that in no other industry do conditions vary so widely as in the coal industry. District settlements of wages and conditions have always existed; they exist to-day, and must continue to exist. Surely, rather too great a stress has been laid on the national agreements of minima and standard wages. I would like to see a permanent National Board of the Coal Industry set up, with equal representation of both sides, and two Chairmen, one appointed by each side, alternating in office at each meeting. To this Board could be submitted all district agreements for consideration before they were actually put into force. Such a Board, sitting at regular intervals, dealing with all questions touching the internal working or general interests of the industry, would be very beneficial. I would like to see its members not ranged on two sides of a table as masters and men, but, as Directors of any commercial

concern, intermingled round a table with only one consideration —the ultimate good of their industry.

Development.

Our colliery owners are undoubtedly keeping closely in touch with new methods for developing and increasing the working efficiency of their pits. Where the capital has been available, good progress has been made, and sufficient achieved to show the advantages that can be reaped. Colliery owners are anxious to advance; but they are held up by two causes:

(1) The uncertainty of the labour position.
(2) The need for capital.

If an agreement could be reached which would guarantee peace for (say) five years, big improvements would immediately be put in hand. To-day finance fights shy of the coal industry. The banks are carrying large overdrafts of collieries; the investor feels no security, and has no confidence in the industry pulling itself together. The industry has been starved for new capital. In the past the greater part of the developments were paid for out of revenue; to-day this surplus does not exist.

Much can be done to increase the earning capacity of collieries. Coal, as it is raised from the pit, is uneven in quality and size, contains a varying but considerable amount of dirt, and cannot be despatched for use without treatment. The grouping of pits will make it possible to do this work at a central station, preferably away from the pit mouth. The concentration of the screening, cleaning, carbonizing, and power supply plants at such a central station (which will be an integral part of each colliery group) will make for lower capital outlay, lower labour costs and overhead charges, and better supervision.

The first necessity is to screen and clean the coal. The result of these operations is that a considerable amount of dirty coals and small coals are left to be dealt with. These residues are of little value to, and often constitute a nuisance to, the collieries. By proper development, these residues can be made of value, and revenue gained from them which would greatly assist the coal industry.

It has been indicated in the Electricity Bill that a system of bus electrical mains throughout the whole country will be installed. This scheme should receive whole-hearted support. I would point out, however, that the central electrical generating stations of groups of pits are the proper sources from which to draw electric energy for the surrounding areas; and this grid-iron scheme of distribution would make it possible. Low-grade coals that are now an encumbrance to the colliery can be readily and most economically used for generating electricity by means of powder firing. At present railway carriage makes the selling price of such coals of little or no assistance to the colliery. If a colliery company has a ready outlet for electricity, many economies of working the coal could be introduced, as the dirtier and very fine coals need not go through the process of cleaning; their full calorific value being obtained by powder firing under boilers. At present, in comparatively small installations, the total cost of generating electricity on the above lines is 0·25d. per unit.

Cheap electricity is undoubtedly needed throughout the country for power purposes; but cheap gas is also required domestically and industrially for heating purposes. The collieries can make gas more cheaply than any other undertaking. At the present time coke ovens are making large quantities of gas which in very few cases is being, or can be, properly used. The country requires a network of bus gas mains, just as we require a network of bus electrical mains. The collieries could supply gas to such mains at (say) 6d. to 8d. per 1000 c.ft.; and as at least 6000 c.ft. of gas are available for sale for each ton of coal treated in the coke ovens or other carbonizing plant of the colliery, there is an immediate revenue of 3s. to 4s. per ton of coal treated. I suggest that each group of pits could well feed a 20,000 kw. electricity generating set, and produce 6,000,000 c.ft. of gas per 24 hours.

There has been, over many years, an agitation for the provision of smokeless fuel to replace coal, and also for the pre-treatment of raw coal to obtain tar oils in order to reduce the importation of fuel oil, motor spirit, &c. The collieries—especially when economically grouped—are ideal for these purposes. Smokeless domestic and industrial fuels can be economically produced in modern coke ovens with coal suitably cleaned, sized, and blended. The proper place for the development of low-temperature carbonization is the colliery. At present the only drawbacks are lack of capital and the difficulty of disposing of the surplus gas and power. Carbonizing processes require small coals; and in future cheaper working in the pit could be introduced, as a greater proportion of smalls will be needed.

Colliery undertakings at present specialize in the manufacture of blast furnace coke, and so are subject to the great fluctuations in this market. They should broaden their interests to include foundry and domestic coke, smokeless fuel, &c., and so have a wider choice of market and a steadier revenue.

I envisage, with a group of pits equipped electrically throughout:

(1) The delivery of all coal raised to a central station.
(2) The simplification of the cleaning, as an efficient method would be available for using all dirty coals and smalls.
(3) The sale of all surplus electricity, which could be economically produced at a low price per unit, but still highly remunerative to the colliery.
(4) The carbonizing of all smalls and slacks to make blast furnace coke, and smokeless fuel for domestic and industrial use.
(5) The sale of all surplus gas to local gas undertakings or large industrial concerns.
(6) The sale of the bye-products from the carbonizing plants.
(7) The despatch of only well-graded clean coal from the colliery, the high natural value of which would economically bear the cost of transportation.

It must be clearly understood that, so far as carbonizing is concerned, these proposals especially refer to collieries working caking coals. Modern development, however, has shown that poorly caking coals can be changed into satisfactory smokeless fuels by carbonization. Briquetting also has proved of value with non-caking coals. In all collieries there is always a surplus of low-grade fuels, if the necessary bus mains are provided. These low-grade fuels can be converted into gas and electricity at low cost, with a resultant satisfactory revenue to the collieries.

I have endeavoured to show how much can be done to improve the revenue from collieries. Two things are needed: Peace in the industry, and a plentiful supply of capital at as low a rate of interest as possible. It is not suggested that the Government are, or can be, in a position to force, or to take any active part in, the unification of collieries in groups, or the putting in hand of developments; but undoubtedly, if the Government promised guarantees under the Trade Facilities Act to approved schemes, unification would come about voluntarily, and colliery improvements and extensions would be put in hand.

Selling.

Coal is being sold to-day at an uneconomical price. The effect of the subsidy has been a general reduction in prices. The Government subvention to a great extent has been passed on to the consumer—more especially the foreign buyer. The subsidy has kept alive collieries which otherwise would have shut-down. Over-production has made the market weak, and buyers keener. The poorer collieries have been selling at what price they could obtain, in order to get in money to pay the day-to-day expenses. The low price of coal and coke has not assisted the heavy industries to any extent; a rise in the price of fuel (say) to the extent of 2s. per ton would certainly not retard a return to normally prosperous conditions, should markets improve. A general rise of 1s. or 2s. in the price of coal would, however, be of very vital importance to the coal industry, and would certainly help it to regain stability.

Definite sales organizations are required, taking the country in areas. A sales department could be set-up in each area, with representation from each colliery. Orders for the area would be pooled, and allocated by agreement to the various pits. By this means the undue cutting of prices under economic pressure would be obviated, although competition between areas would still be maintained. The areas should not be too large—say, in no case greater than 15 p.ct. of the total output of the country. Another advantage of such area selling organizations would be that a representative of the workers in the area could be appointed to the Board. To-day one of the gravest causes of suspicion on the part of the workers is that they do not consider they have a proper knowledge of selling prices. These selling prices control the benefits accruing under the profit-sharing arrangements in force (the 87-13 division), so that the advantages of the above proposal can readily be appreciated.

The area selling organizations having been set-up, it would be an easy step to an arrangement between those areas interested in the export of coal to ensure an equalization of rates, and to prevent the cutting of prices. Economic conditions would prevent unfair prices; and competition between areas, from abroad, and from other forms of fuel, would keep producers keen.

I have only dealt with what appear to me to be the chief factors of the situation. To-day is a most difficult time in which to speak; but it is essential that we should all form our own ideas, as public opinion in this, as in all national disputes, must carry great weight.

ELECTRICITY BILL.

I will now turn briefly to the Electricity Bill. Every political party has tried its hand at fuel conservation and electricity production. From the various speeches which highly placed politicians have made, it would appear that a cheap supply of electricity will solve our industrial problems, and bring peace and comfort to all our citizens in the workshop, factory, farm, or home. We all appreciate the benefits of a cheap and general supply of electricity; but we all know that its bearing on industrial prosperity is not fundamental, and that there is a grave risk that, by trying to do too much, too little will be accomplished—in fact, harm may be done.

We may take it for granted that the Electricity Bill after amendment will pass into law. Let us endeavour to suggest amendments which will make the scheme more workable. In the first place, the Bill lays down in section 4 that a scheme is to be prepared. When we appreciate the scope of the scheme, we must be amazed at its magnitude. It covers:

(1) The concentration of electrical generation in a comparatively few central stations.

(2) The inter-connection, by means of grids, of all areas, and of the generating and distributing stations within such areas.
(3) The standardization of frequencies.
(4) The arrangements under which all electrical current will be purchased from the selected generating stations, and sold to the undertaker for distribution.
(5) Any other provisions that may be necessary.

This is surely a bigger job than has been put up to any one body before. Let us look at it for a moment as it affects the coal situation. The colliery, or more especially a group of collieries with a central station, is in a position to manufacture electricity at a lower price than any central generating station. Everyone stands to gain by such an arrangement. The colliery would receive increased revenue from the sale of its surplus electricity; the small and dirty coal, which to-day is not only of little value, but an absolute nuisance, could be efficiently utilized; and the Electricity Board would benefit by being able to buy cheap power. A further most important point is that the national load factor would be improved. With collieries electrified to the fullest practical extent, there would be added a continuous demand of very considerable magnitude. I would therefore suggest that, before new stations are built, or existing stations considerably extended, the possibilities of supplies from the collieries should receive the closest attention and scrutiny. The construction of the grid must be to the national advantage, and would be essential to the proposal of collecting supplies from the collieries.

It is interesting to note that the strongest opposition to the Bill comes from the electrical industry itself. We have all read the statements of the respective cases appearing in the Press. The attitude of the gas industry is rather that they are very satisfied the word "gas" does not take the place of the word "electricity" throughout the Bill.

The following are some of the objections:

(1) That the Bill endeavours to do too much; that the scheme should be tried-out first in a selected area.
(2) That the concentration of generation in a few large stations makes the country very vulnerable to the disruption of power supplies in time of war or industrial strife.
(3) The proposals would tend to fix development of the generation of electricity at the point that it has reached to-day. Very heavy expenditure is involved, repayable over long periods, so as not unduly to augment generating costs. Should new and more economical methods become possible, their adoption would be made difficult.
(4) The scheme proposes the centralized control of all generation of electricity, with bureaucratic methods for ascertaining payments to be made, so doing away with individual efforts towards efficiency.
(5) The scheme would of necessity cramp the initiative of all those at present concerned in the generating side of the industry.

To me, the chief objection to the Bill is that the Electricity Board will function under entirely uncommercial conditions. The Board is controlled in many respects by the Electricity Commissioners. It may not make a profit, and presumably cannot make a loss. It is appointed by the Minister of Transport, and is not subject to criticism by the generator and distributor or consumer of its commodity. Surely, we cannot look to truly economical working under these conditions. As proposals for discussion, I would suggest:

(1) Area Boards instead of a National Board, thus bringing the duties and responsibilities of the Board within manageable limits.
(2) The election of at least a proportion of the members to the Board by the interests in the area.
(3) The Electricity Commissioners to be the technical advisers to the Board.
(4) The Board to arrange prices for the purchase and sale of electricity, which would allow of a profit being shown.
(5) The Board to meet the representatives of the generators and distributors in general meeting every six months, when the conduct of business would be similar to that of a general meeting of a company.

I believe that a scheme based on these lines would have a greater chance of success than the proposals now before us in the Electricity Bill.

I have already endeavoured to cover too much ground. My object in speaking to you to-night is to encourage thought. I trust I have been successful. We are faced with great problems; our natural British characteristic is to let someone else do the thinking, as well as the job, for us. As citizens and workers, we are all vitally concerned, and each has the responsibility of forming sound public opinion to protect the national interests. If I have in any way assisted you to perform that duty, I am more than satisfied.

Discussion.

Mr. HAWKYARD said that it was stated in the address that 87 p.ct. of the money received for the coal, less costs of production other than wages, was taken as labour's share. What were those costs of production other than wages? Again, surely the organization in the mines was wrong when one man worked at ordinary day rates and another on piece-work rates. In the formation of National Committees a great deal depended upon their personnel. It ought to be possible to utilize fine washings without going to the extreme measure of making the coal into briquettes, which might be said to be rather an extravagant way of using-up fines. The big field for coke was in the domestic region, rather than in the industrial area. He would like to know Sir Arthur Duckham's opinion as to what was the best ownership of mines. It was rather surprising to hear mention made of a rise in the price of coal. Why should there not be a reduction in price? Industry depended upon reductions, and not increases.

Mr. ROBERTSON, speaking from the point of view of the electrical side of the industry, was more than pleased to find how very much of the address he was in agreement with. He would like to say something, first, with regard to the coal industry—not that he professed to be an expert or to have any authority to speak upon it. When they mentioned mutual understanding and co-operation between miners and owners, they must not forget the history of the mining industry during the past thirty or forty years in this country. The miner was suspicious to-day of any attempt to bring him in as a profit sharer or part manager of the collieries. His own recollection went back to the time of a colliery strike in the West of Scotland, when the miners were striking to get a minimum wage of 3s. a day. He had been in the houses of the miners; they were provided by the colliery proprietors. He knew the conditions before the Truck Act was abolished; and one could not wonder if the legacy which the miners had there influenced them and roused suspicion in their minds to-day of any advances that were made in the way of profit-sharing or joint control. The Electricity Bill was a somewhat heroic and resolute attempt to solve a very great problem. Whatever they might think about it individually, they must at least give credit to the Electricity Commissioners and the Government advisers for having done their best to bring about co-ordination for the supply of electricity, and a state of things which would enable electricity to be sold much more cheaply than previously. There were, however, some very big "buts." One must agree that the fundamental questions underlying the Bill had not been fully explored; and he, for one, was sorry that, before launching a measure which was going to involve such an enormous expenditure, and to cause such very important alterations in the present system of dealing with the generation of electricity, the Government had not appointed an independent Commission, and heard evidence which would have dealt with the question from every point of view, and not alone from the point of view of the electrical engineer. With regard to the question of pithead generation, he must say that he had held the view for a long time that there was a very great deal to be said for the claims advanced by Sir Arthur Duckham. The grid system was not the simple matter which it was assumed to be in the Weir Report or the Electricity Bill. The transmission of electricity was rather different in this country from what it was in America or even in Continental countries, where overhead transmission could be employed at 110,00 volts, or more, over large areas. Water power was sometimes used in such systems; and the result was that it was possible to design and construct a very big system which would deliver electricity cheaply 50, 60, or even 80 miles away from its source of generation. In the case of the industrial districts of this country, overhead transmission was going to be very limited. The limits of underground transmission at present were about 133,000 volts; and even at that voltage there was not freedom from trouble. This meant that the transmission of electricity was going to be an expensive matter for big areas. To talk, as some people talked in the House of Commons, of transmitting electricity from Cornwall to Leeds, was nonsense. Industry followed the coalfields. If a system was established of pithead generation of electricity combined with carbonization of the coal, it would be found that the demand for the supply of electricity required for power purposes would probably lie within a radius of 10 or 12 miles from the centre of generation. This would be a feasible and reasonable distance to transmit electricity. He quite agreed that the co-ordination of the supply of electricity should be by means not of a Central Board, but of Area Boards.

Dr. R. LESSING was in absolute agreement with Sir Arthur Duckham in the way he regarded the various findings of the Coal Commission. He was particularly pleased to find the address dealt with such matters as the utilization of fine coal and the cleaning of coal to a very much greater degree of purity than was customary at the present day. Co-operation between masters and men was not the only kind of co-operation which was required. There should be grouping of collieries and unification of production. Sir Alfred Mond had recently put forward the suggestion that the coal industry could be placed upon a sounder basis by the adoption of selling syndicates, established, if possible, on a voluntary basis; and, if such a course should be found to be absolutely impossible, that State pressure should be applied in order to further the setting-up of such selling organizations. Similar organizations to those proposed by Sir Alfred Mond were in existence in America, and functioning satisfactorily; but perhaps the best example was that provided by the German coal industry. By a law of 1910, the setting-up of selling syndicates in the various German coalfields had been made compulsory, though such compulsion was not needed in the case of the more important districts. In the Ruhr district, a selling syndicate, perhaps the most powerful and the best managed in the whole world, had been in existence for the last 33 years. It was founded in 1893, after a considerable amount of divergent opinion had had to be pacified. The contending parties had to be brought together. To-day, they were in a position, by reason of their unified methods of selling, to compete successfully with British coal. The coal question must be regarded as essentially a world problem. Coming to commercial arrangements between different countries was quite impossible, as long as there was not a single body representing each. Until this came about, the customary methods of competition would have to prevail. The appointment of such a selling authority would have a vital technical influence. In Germany, at any rate, it had been

found that, by relieving the coal producing side of the industry of the purely commercial work of disposing of the coal, those in charge of the collieries were able to devote the whole of their energies to the technical development of the collieries; and the average German mine was now of very high technical efficiency, though in making this observation he did not wish it to be inferred that there were not mines in this country of at least equally high technical efficiency.

Mr. Beesley thought that the subsidy had very few friends, and very many enemies. Although, personally, he did not care for the idea of a subsidy, one should be certain before condemning it that the cure was not going to be as bad as, or even worse than, the disease. It was at least worth considering whether it was better to keep the industry going, and the miners employed, by paying a subsidy direct, or whether there was any advantage in making the miners work the extra half-hour a day for the same wage, and possibly double or treble the number of unemployed miners who would go upon unemployment pay, which was simply another form of subsidy. Co-operation between the mine owners and the miners could be brought about by the establishment of a Joint Council of representatives from both sides, such as already existed in the chemical industry.

Dr. H. Levinstein, in proposing a vote of thanks to Sir Arthur Duckham, expressed himself as a firm believer in the necessity for this country working out the conversion of water gas into liquid fuel.

Dr. Lessing seconded the vote, which was carried by acclamation.

Sir Arthur Duckham, responding, said that he must refer Mr. Hawkyard to the report of the Coal Commission regarding the 87 and the 13 p.ct. What was covered was all charges, other than wages, that were against the selling price of coal. Those who were occupied at collieries, and had to do washing, would know that there was the greatest difficulty in getting the water out of the fines after washing, and making use of the fines. There was 20 to 25 p.ct. water; and he knew of no apparatus existing to-day which would take this amount of water out of the fines. He did not know what Mr. Hawkyard meant by "ownership of mines;" but he was not in favour of nationalization. He was aware that there was a very strong feeling among electrical engineers with regard to the Electricity Bill. They all wished for a cheap and good supply of electricity; but it was felt the Bill did not hold out any certain prospect in that direction. He was sure the Bill would be amended by the Government; and he hoped that the Committee would not hurry consideration, and would give the matter the greatest possible publicity. He asked, before the Bill was published, that it should be put up for discussion; but the political people concerned felt that such a course would be *infra dig.* Mr. Robertson had spoken about the feeling of the collier against profit sharing; but workmen were profit sharing to-day. Colliery working was one of the few industries in which there was no profit sharing actually in force. The matter only required to be followed up. He was quite certain that the establishment of a selling organization was a sound proposition. Respecting the subsidy, the great need to-day was to place the coal industry on an economic basis. Any industry which was working under a subsidy was not on an economic basis. If it had not been for the war, and the conditions existing after the war, many of the non-paying or unprofitable pits would be shut-down to-day. They had been kept alive by the subsidy. It would be for the good of the country that they should be shut-down, and not hinder industry.

CLOCKWORK GAS CONTROLLERS.

Abstract of a Lecture by E. H. Horstmann delivered at the British Horological Institute on April 21.

In the absence, through ill-health, of the author (Mr. E. H. Horstmann), the paper, the full title of which was "Clockwork Controllers and Electric Time Switches," was read by Mr. J. H. G. Horstmann.

After an interesting historical introduction dealing with the early methods of lighting and extinguishing, the author states that from the horological point of view the operation of a gas tap at a predetermined time by clockwork is an old achievement. The invention of gas controllers for the automatic operation of street lamps dates back to 1807, and is due to a Dr. Thurgar, who was a Norwich surgeon. Dr. Thurgar's controller was a clever piece of work, and contained several of the essential features of all clockwork controllers—viz., a small and reliable time-piece having an 8-day or a longer run, means for operating the gas cock, means for setting the operating device to predetermined times, and a by-pass. The first serious step in the use of gas controllers in any general way in this country seems to have been made about 1890, when Mr. John Gunning, of Bournemouth, put on the market an instrument which, "being cheap and fairly efficient, had a ready sale from the start."

In 1904 the author's firm, the Horstmann Gear Company, Ltd., of Bath, devised their Type 1 controller, which contains two patents—one for the automatic adjustment of the times of lighting and extinguishing, and the other for rendering the gas tap operative by hand, without disturbing the automatic sequence of operations. It is fitted with a fixed clock dial with hands, while the automatic adjustment dial is placed at the back of the clock. Shortly after this invention, Mr. Sparks, of Nottingham, brought out his quick-lighting controller, which was a clever adaptation of a French carriage clock movement for the purpose of operating a balance weight, which, having its fulcrum at the gas plug, gave it alternate movements backwards and forwards as the dial rotated in one direction.

By this time the Horstmann Gear Company had gained more knowledge of the requirements of public lighting authorities. The fact that gas companies' schedules were subject to alteration at the desire or caprice of local authorities was one reason for the manufacture of a new type of clockwork movement capable of considerable variety in the finished product. In patent No. 23161/09 a new style of going barrel was embodied. This barrel eliminated the following defects: Stopping of the clock during winding, back-lash on the dial plate, difficulty of accurate adjustment, disturbance of the dial plate during winding, necessity for a small dial, lack of power for operative work, and the need for a geared motion to connect the dial with the timing mechanism.

Another feature of patent No. 23161/09 was the possibility of extending the length of run without increasing the diameter of the clock or altering the wheel work. The ordinary Type 3A controller is now made to run 15, 28, or 35 days.

Other improvements followed. One device enabled the pilot to be extinguished during lighting hours. Often considerable economy can be effected by this device. Further modifications enabled the controller to light a group of burners at dusk, extinguish part of them at midnight, and extinguish the remainder at dawn. By the addition of extra tappets to the dial plates, controllers which nominally light and extinguish once in 24 hours can be made to do so twice during this period. This is useful in manufacturing districts, where light is not required after twelve at night, but is needed again in the early morning, when the industrial population are going to their work. As this does not apply to the summer, provision is made to render these additional tappets instantly inoperative without removing the dial.

These modifications have been carried out in both single and double train movements; the idea being that the latter shall be used when a powerful operation of the gas cock is required. There are, of course, instruments in which only the double train movement can be employed, notably in the Company's Type 5 controllers for the operation of main taps. These are made in standard sizes for ½-in., ¾-in., and 1-in. main taps, and are used for linotype machines, plumbers' pots, and many other manufacturing purposes where preheating is essential if the workmen are to start with their work immediately on their arrival in the morning. Group shop and industrial lighting is also effected by Type 5 controllers in conjunction with Sugg's distance control. In connection with shop lighting, it has been found necessary to add a selective device to the operating machanism. This selects certain days in the week for special treatment or for omission. Sundays, for example, may be omitted, while on another day the lighting can be commenced earlier or continued later. Any variation can be made by the owner, for which purpose adjustments are provided.

Up to this stage a considerable range of components had been standardized and brought under mass production by the Company; and the single and double train movements contained many components common to both. There were, however, still too many models; and the Company devised their UNI systems, the idea of which was that the clocks should be cased in a drum provided with standard fittings, and that the gas cock should form a separate unit to which the clocks should be instantly attachable. By this system erection is rendered simple, and repairs can be effected by removing the clock, and replacing it by a spare, without even breaking the mantle. Mr. Horstmann mentioned that Liverpool are having 5000 of their controllers converted to the UNI system.

The exterior position of the gas cock in UNI controllers renders it possible to adopt auxiliary hand lighting in times of fog. The discriminating feature of Horstmann controllers renders this possible. In a fog the light can be turned on by hand, in advance of lighting time, with the knowledge that at schedule lighting time it will not be turned out by the action of the controller, but will continue alight until the schedule extinguishing time.

Mr. Hope Jones, President of the British Horological Institute, presided at the meeting.

In the course of the discussion which followed the reading of the paper, Mr. W. J. Liberty, Public Lighting Superintendent to the City of London, said that he had found the controller which was before the meeting to be efficient in that it was a "quick lighting" controller, and prevented back-firing, which was apt to occur with "slow lighting" controllers. There was a large field for the use of these instruments in shop-window lighting, both interior and exterior.

Mr. J. E. Gould, Chairman of the Bland Light Syndicate, Ltd., proposed a vote of thanks to Mr. Horstmann.

BUILDING INDUSTRIES AND GAS.

THE GAS LIGHT AND COKE COMPANY SHOW WHAT CO-OPERATION WILL ACCOMPLISH.

On Tuesday and Wednesday of last week, the Gas Light and Coke Company received representatives of the building industries, to the number of about 150 on each day, at the Head Offices in Horseferry Road, for the purpose of an inspection of the new showrooms which have recently been opened there, followed by a visit to the Company's exhibit (described and illustrated in the "Journal" last week) at the Building Trades Exhibition, Olympia. The visitors came, and saw, and admired. They learned how invaluable is the service that gas offers to the community, and to what a great extent the enjoyment of this service may be facilitated by close co-operation between the building and the gas industries. That this was so, many remarks by the visitors made evident. The Company may therefore be congratulated upon a happy idea, and the bringing of it to fruition in the happiest style.

The Gas Light and Coke Company are at all times desirous of co-operating with the builders of London in making its homes more comfortable, convenient, and hygienic, and its atmosphere and its public buildings free from grime and corrosive acids. This they feel they can best do—and constantly seek to do—by supplying at reasonable prices the most efficient appliances of good design, gas of constant quality and pressure at the lowest possible cost, and competent, courteous service in ensuring that consumers get the fullest value for all the gas they use. It is "up to" the builders to take the fullest possible advantage of all that such a policy on the part of the Company conveys.

The Modern Gas Fire.

In the magnificent new showrooms at Horseferry Road—described with photographs in the "Journal" for March 31 last—the builders who accepted the Company's invitation last week saw for themselves, and were much interested to see, that, with modern gas fires it is not only possible, but easy, to combine the æsthetic—the beautiful—with the practical, the economical, and the convenient; and especially easy if the designer and builder or re-constructor of houses will do his part by providing from the outset for modern gas fires, instead of for the obsolescent coal grate which has to be hidden by, or displaced by, a gas fire installed as an afterthought. They further had it brought home to them that with the aid of such gas fires—that are as much more economical as they are more artistic than the old-time monstrosities of design and construction—and with the aid of gas cookers and gas or coke water heaters, the builder can help the housewife to solve at one and the same time the pressing problems of a peaceful atmosphere within a beautiful home, through the abolition of dirt and drudgery, and of a purified atmosphere and a sunny city without, through the abolition of smoke.

How Gas can Reduce Building Costs.

Subsequently, at Olympia, all this was yet further emphasized, with additional all-important factors—namely, that the products from gas fires can be satisfactorily removed and reasonable ventilation of the rooms be effected, and the cost of building houses, flats, and offices can be, and has been, materially reduced, by the use of properly constructed flues of smaller area than are required for the smoke and soot producing coal fire.

It was pointed out to the visitors that eminent architects have estimated the saving to be effected by the use of special gas flues at as much as £10 per room, as their use eliminates the chimney-breast and the concrete hearth, thus allowing the joists to run straight through without "trimmers," and at the same time, of course, increases the available floor space. This estimate of saving, it was added, may be regarded by some as put too high for general application; but it certainly would not be less than £5 per room in any case.

In the Liverpool Corporation Housing schemes over 20,000 gas fires were installed with "Economy" flues, thereby effecting a saving of over £100,000, and releasing skilled labour for much-needed use elsewhere; and the gas fire mantel register shown at the Company's Olympia exhibit, and referred to in the "Journal" last week, in conjunction with the "Economy" flue, is being installed by the thousand, not only in Liverpool, but also in London, Manchester, Birmingham, Glasgow, Edinburgh, and elsewhere.

Hospitality.

The inspection of the showrooms and visit to Olympia were preceded by luncheon in the big staff messroom at Horseferry Road. The Governor (Mr. D. Milne Watson, D.L.) was in the chair, and was supported by Mr. W. L. Galbraith (Secretary), Mr. T. Hardie (Chief Engineer), Mr. F. W. Goodenough (Controller of Gas Sales)—whose department is directly concerned with good relations between the Company and the builders—and other Heads of Departments.

The Governor heartily welcomed the guests to the birthplace of the gas industry, and emphasized many of the facts mentioned here. He told his hearers that gas was never more alive than it is to-day; and that those who imagine that, because of all the talk about the advent of the "Electric Age," the gas industry is doomed or moribund, are greatly mistaken. There is, he admitted, a great field for electricity; but that field does not, in any substantial degree, touch the great field for gas and coke—the field of fuel supply. Gas is rapidly increasing in popular demand, as the following figures of the make of gas in this country show:

1903	. . . . .	160	thousand million c.ft.
1913	. . . . .	219	" " "
1923	. . . . .	260	" " "
1925	. . . . .	295	" " "

This represents an increase of 84 p.ct. during a period when (1) great improvements were achieved in the efficiency of gas appliances, and (2) there was an enormous expansion in the electrical industry. The figures are proof alike of the growing utility and popularity of gas, and of the fact that there is ample room for both gas and electricity in the service of the nation.

As a matter of fact, the Governor pointed out, the last three or four years have witnessed the greatest expansion in the history of the industry; and every year now sees a greater increase than the last in the demand for gas appliances. The gas appliances in the Company's district increased by 1,400,000 in the 23 years already referred to, or 400 p.ct. In the same period, the sootfall in London decreased by over 50 p.ct., the hours of sunshine increased by 50 p.ct., and the death-rate fell by one-third. Although gas does not claim the whole of the credit for this improved state of affairs, it has undoubtedly done a great deal to render life in the big cities more healthy and more enjoyable. Gas is now as essential to the complete equipment of a house as water or drains, and that house fetches the best price that is fitted throughout with piping of adequate size to every possible point of usage for cooking, heating, and hot water supply.

Comparative Costs.

As proof of the accuracy of the statement that gas holds the field of fuel supply—except for prolonged use on a large scale, when coke steps in on the ground of economy—it might, went on the Governor, be mentioned that comprehensive, thorough, and prolonged tests, on practical everyday working lines, were recently completed by a special Committee for the purpose of determining, with the most modern appliances, used under the most favourable conditions so far as electricity was concerned, the relative costs of cooking for a family by gas and by electricity. These tests proved conclusively that, for equal service under practical conditions, cooking by electricity at 1d. per unit costs three times as much as cooking by gas at 8d. per therm, and that there is no greater loss of weight in the meat cooked by gas than in that equally well cooked by electricity. That is one of the reasons—there are others also—why the Company are continually installing gas cookers in place of electric cookers that have been tried and found wanting, and why electricity will not find scope for development in the field of fuel supply.

The Governor, in the course of his remarks, made well-deserved recognition of the great credit due, for his architectural work on behalf of the Company and of the industry, to Mr. Walter Tapper, A.R.A., F.R.I.B.A. He also said that the thanks of the industry were due to the Davis Gas Stove Company, Ltd., for the pioneer work they had done in connection with gas showrooms.

Facts Concerning the Company.

In the showrooms the visitors saw a bust of William Murdoch, by whom the practical application of coal gas to houses and streets was first demonstrated; and another of Frederick Albert Winsor (the first man to exploit the discovery), through whose enterprise and enthusiasm Pall Mall was experimentally lighted by gas in January, 1807 (as it is to-day), and by whom the Gas Light Company was founded in 1812 under Royal Charter granted by George III., when the Horse Ferry (which gave its name to Horseferry Road) still plied where Lambeth Bridge now spans the river, and Chelsea was a pleasant suburb through which ran the King's Road from His Majesty's Palace of St. James to the village of Fulham.

The visitors also had their attention drawn to many facts of general interest in connection with the Company, whose original capital was £200,000, whereas it is now £33,750,000, which is held by 48,500 shareholders. No dividend was paid until 1817; and no Government subsidies or guarantees were ever used to foster the use of gas. Meters were in the early days unknown; and the consumers did the "profiteering." The sale of gas in the Company's present area in 1925 equalled 44,000 million c.ft., or 220 million therms—nearly 25 p.ct. increase since 1921. This was made from 2,425,000 tons of coal and 21 million gallons of oil, and supplied through 3400 miles of mains. The consumers (including H.M. The King and all ranks of his subjects) number over 1,136,000, of whom 664,000

buy through prepayment meters, paying about 600 million pennies (some 5000 tons) into the meters annually, or nearly 2 million pennies every day.

After Pall Mall, the first public thoroughfare lighted by gas was Westminster Bridge in 1813, followed in 1814 by the displacement of the oil lamps by gas in the parish of St. Margarets, Westminster. To-day, Whitehall, Victoria Street, Pall Mall, St. James's Street, Piccadilly (East), Regent Street, and Shaftesbury Avenue are famous for their brilliant gas lighting by lamps of from 2000 to 3000 c.p., supplied by gas under pressure through special mains from Horseferry Road.

The Company are convinced that the satisfaction of their 1,100,000 customers with a good supply of gas at a low price, coupled with the efficient maintenance of all apparatus, so that the consumer may get full value for his consumption of gas—a standard of service which it is their constant endeavour to ensure—can best be achieved by satisfied employees who are themselves directly interested in the Company's success. The central feature in the Company's welfare scheme is the co-partnership inaugurated in 1909. All regular employees participate both in the benefits of this scheme, and in the election of the Co-partnership Committee. Already over £500,000 of stock is held by 11,400 co-partners. Works Committees elected by all grades of workmen under the Chairmanship of the Engineers and Heads of Departments provide opportunities for the regular discussion of matters relating to the well-being of the Company and their employees. The Company encourage suggestions from their employees for the improvement of the plant, the prevention of accidents, and any other matters connected with their work; and the Directors, upon the recommendation of a representative Committee, grant suitable awards. For many years pensions have been granted to old employees on retiring; and both staff and workmen now have contributory schemes providing for superannuation on an adequate scale. In addition, the workmen's Benefit Society and the War Memorial Fund, both founded and carried on with the help and encouragement of the Company, make suitable provision for cases of sickness and distress.

It is the policy of the Company to give, as far as possible, opportunities of advancement to all the employees. Apprenticeship is encouraged throughout the Company, particularly in the Gas Sales Department, where about fifty boys are every year started on an excellent course of technical training combined with general education over a period of six years. Many who started in this way now hold responsible positions on the salaried staff. The Sports Association, with grounds at Acton, Woodford, East Ham, and Beckton, provide facilities for practically every form of sport—particular attention being paid to football, cricket, tennis, and bowls. At the annual sports in June, there is an attendance of employees with their wives and children of some 22,000. There are also two Companies of the Rangers Battalion of the London Regiment made-up of the Company's men, and a third is in process of formation. Mr. Milne Watson is the Honorary Colonel of the Battalion.

DRY GAS PURIFICATION.

A Suggested Basis for Comparing Working Costs.

By H. J. Hailstone.

In dealing with the removal of sulphuretted hydrogen from coal gas by means of oxide of iron mixtures, it is often difficult to decide off-hand whether it is worth while to put in an oxide which has already been used several times, or if it is of greater advantage to replace it with fresh material. The degree of sulphur content up to which it is desirable to work is to some extent governed by the market conditions, particularly as regards the lower limits. So far as the higher limits are concerned, this paper outlines a rough method by means of which it should be possible to arrive at a basis for comparing working costs, and so guide the control along the most profitable lines.

The usual mixture in general may be said to consist of hydrated oxide of iron with which is associated a certain amount of siliceous matter, organic matter (such as peat or sawdust), and moisture. An average analysis of new material as put into the purifiers the first time gives 20 to 40 p.ct. of moisture, and 25 to 40 p.ct. of Fe_2O_3,H_2O. When this is fully spent and ready for sale, it will contain in the region of 3 to 10 p.ct. of moisture and 40 to 65 p.ct. of sulphur. All these figures are on the wet basis.

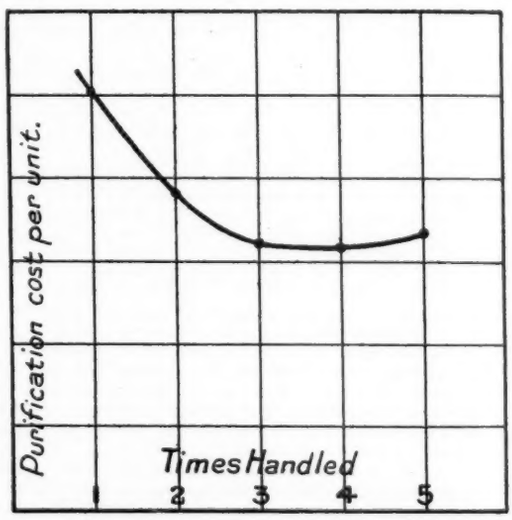
It is almost a universal practice to determine the moisture and sulphur contents of oxide mixtures before and after use in the purifiers; and from the information obtained, a considerable amount of useful data may be derived.

Remembering that the important point to be clear upon is how many times it will pay to put in an oxide for further working-up, prior to final disposal, this must be worked out independently for the set of conditions applying to the particular case. On the various works many local factors play their part—the type of purification plant, its capacity, the grade of oxide, the method of working, &c.—but it is not a difficult matter to reduce these down to a rough approximation for individual cases, so that the resulting information may serve usefully to guide the works practice. Handling the oxide any more than is necessary is naturally avoided as far as possible in all works; but that the additional gain in sulphur value does not exceed the extra cost involved in handling it again in the purifier is not always an adequate economic reason for discarding it. Partially-spent oxides have to be replaced by new mixtures; and there is a definite economic limit for each case. This may be illustrated by graph 1, which indicates the cost of sulphuretted hydrogen extraction by oxide after each successive time fouled in the purifier. It is noticed that for this particular case four times in the box shows the lowest cost per unit of H_2S. Since the cost when used three times only is but the merest fraction above that of four times, it would be decided in such a case that no real advantage accrued from further working up.

As already stated, local factors as to costs and values must be employed in drawing-up a chart suited to the individual works—some parts of this data will be definite, while the remainder must be averaged-out as actual experience indicates.

Preliminary Calculations.

The whole system of the calculations is approximate only, and to avoid additional complications ignores errors due to the presence of excessive amounts of tar and "blue" in the oxides.



Graph 1.—Illustrating Cost for Sulphuretted Hydrogen Removed after Each Time Oxide is Fouled.

These are not normally so high as to introduce serious errors in the approximations.

In the formulæ given below, the following symbols will be used:

Original "oxide" moisture content	Mo p.ct.
" " sulphur "	So "
" " weight	Wo tons
Used "oxide" moisture content. (According to whether it has been fouled once, twice, or finally.)	M_1, M_2, Mf p.ct.
Used "oxide" sulphur content	S_1, S_2, Sf p.ct.
" " weight	W_1, W_2, Wf tons
Weight of sulphur taken up by "oxide"	A_1, A_2, Af tons
Average amount of H_2S entering purifiers per 100 c.ft. of gas	g grains
Annual make of gas (million c.ft.)	G

$$\text{Since } Wo\,(100 - Mo - So) = Wf\,(100 - Mf - Sf)$$

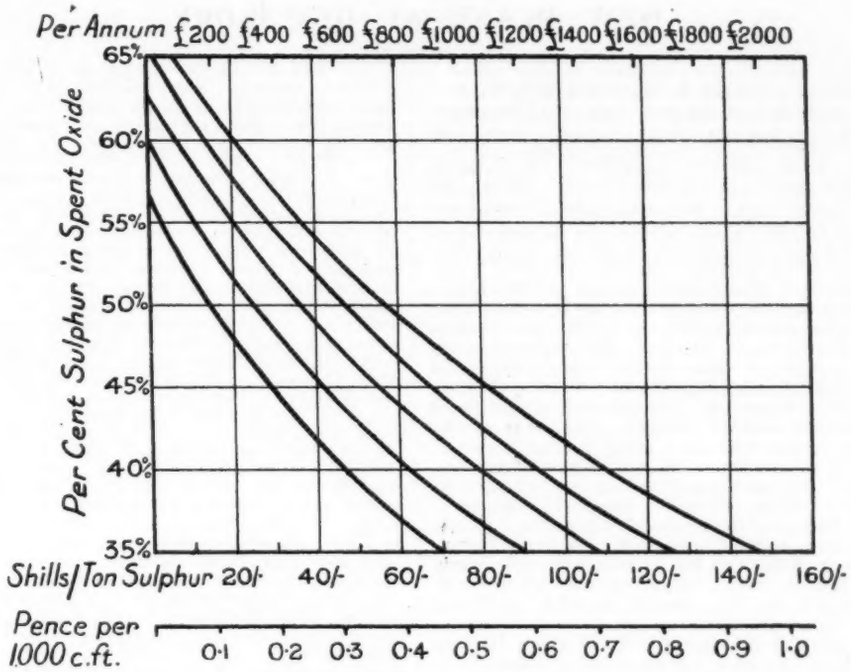
$$Wf = Wo \times \frac{(100 - Mo - So)}{(100 - Mf - Sf)}$$

The bracketed portion $\frac{(100 - Mo - So)}{(100 - Mf - Sf)}$ will be of repeated use throughout the calculations; and for convenience it is abbreviated and represented by the symbol k.

Thus, $Wf = Wo \times k$.

Now the amount of new "oxide" required per annum will be

$$\frac{G \times g}{Sf \times k} \times \cdot 06 \text{ ton.}$$



Graph 2.—A Typical Chart, giving Works Costs of Purification (One to Five Foulings) when Spent Oxide Sulphur Content is known.

The weight of spent oxide produced will be

$$\frac{G \times g}{Sf} \times \text{·06 ton.}$$

It is advantageous to know the weight of new "oxide" put into any purifier; and this is readily found from the purifier area, the thickness laid down, and the apparent density of the material (as determined by the weighing of 1 c.ft. or more). When this material has been fouled and is taken out either for revivification or for sale if suitable, its weight may be worked out by formula unless it is found convenient to weigh during cartage. Thus $Wf = Wo \times k$, as already stated.

Proceeding further, it will be seen that the weight of sulphur taken up during one fouling can be expressed as

$$A_1 = \frac{Wo}{100} \times \left\{ \frac{(100 - Mo - So) \times S_1}{(100 - M_1 - S_1)} - So \right\}$$

$$\text{or } \frac{Wo}{100} \times \left\{ (k \times Sf) - So \right\}$$

This gives a ready means of roughly determining the weights of sulphur taken up during each fouling of a batch of material; and the whole series of figures will show the performance of the oxide from the time it is first put into use till the time it is ready for sale. The "sulphur taken up" figure may be converted into any desired equivalent, such as "volume of gas purified," &c., and should tally fairly closely with the figure derived from the daily tests for H_2S absorbed by the purifier, and the weighings of the bulk, if obtainable.

Cost of Operation.

Coming to the really important point, the net cost of removing sulphuretted hydrogen from gas by "oxides," useful comparative works figures may be obtained by working along these lines; and the degree to which it is economically desirable to work up any batch of used material may be computed.

The most convenient basis for making the calculations is on the cost per ton of sulphur extracted—*i.e.*, $A = G \times g \times 0{\cdot}0006$, and from this any other desired ratio can be obtained, such as cost per therm or per 1000 c.ft.

The chief items in the process account are (*a*) the cost of the material employed; (*b*) the cost of handling, &c.; (*c*) the value of the resulting spent material; and (*d*) the volume of gas purified. Dealing with these in more detail, (*a*) may be resolved into weight per purifier multiplied by price per ton at works—*i.e.*, $Wo \times p$ (shillings), the former being known and the latter obtainable from works accounts. Item (*b*) depends upon the number of times (T) the material is worked up in a purifier, and upon the general labour and mechanical costs incidental to filling a box, discharging after fouling, and disintegrating, carting, turning, &c., till revivified. This figure is known from experience in each works—the number of men and the time they spend on the job of handling a boxful of normal material can always be fairly well averaged, while other incidentals such as cost of steam or power, repairs, carting, &c., may be added.

Such a figure divided by the average weight of oxide dealt with in each purifier gives the average cost per ton of oxide handled (*h*), so that item (*b*) may now be expressed $T \times h \times Wo$ (shillings).

With regard to item (*c*), the value of the spent material is the product of the weight and the price obtainable per ton—the latter being proportional to the sulphur content. From market figures, a unit price may be ascertained for each per cent. sulphur per ton (*u*), after due allowance for carriage, &c. The approximate cost of removing one ton of sulphur from gas may now be expressed as follows:

$$\frac{(Wo \times c) + (T \times h \times Wo \times 1{\cdot}2) - (Wf \times Sf \times u)}{Af} \text{ shillings.}$$

This all looks very involved, but actually it is simple when the costs and figures for an individual plant are filled in. The costs for a full range of sulphur contents usually met with can be computed by an hour's work with a slide-rule, and the figures derived plotted in graphical form against the sulphur content of the final oxide, as is shown by graph 2, which has been worked out on the above lines. Charts of this type bring home very thoroughly the advantages which accrue from any improved working-up in the purifiers. Thus, in the example given it will be seen that any improvement in working which enables an oxide to be worked up in three times to 50 p.ct. sulphur content where previously four times was necessary means in the case quoted an annual saving of £140—*i.e.*, a reduction from £630 to £490. Furthermore, such charts serve as a particularly useful guide as to the advisability, or otherwise, of again putting in an old oxide for further fouling. From the chart, it will be noticed that it will only pay to rework an oxide with 46 p.ct. of sulphur if a resulting test of more than 49 p.ct. can be assured. Whether this is likely or not depends entirely upon the individual methods and conditions.

Where augmented rates are obtainable for higher ranges of sulphur content, the curves will be "stepped;" but otherwise no difference is necessary in the method of computation, which consists of reducing the various factors to terms of known quantities. The variables may then be arranged in columns according to the sulphur content, to give the data for plotting required curves. The cost per ton of sulphur may be converted into cost per 1000 c.ft. or cost per annum.

In conclusion, it is again emphasized that the figures will be applicable only to the particular case for which the relative data have been obtained; and suitable graphs must be elaborated for each works involved. Further, they are to be regarded as approximations for comparative works purposes, and in no sense are intended for balance-sheet statistics.

Midland Association of Gas Engineers and Managers.—The spring general meeting of the Association will be held at Dudley on Thursday, May 6. Visits will be paid to the Netherton Ironworks, Forges, and Mills of Messrs. N. Hingley & Sons, Ltd., the Dudley Gas-Works, the works of Messrs. Metallisation, Ltd., and the Gas Exhibition at Trinity Road, Dudley.

NEW PLANT AT DEWSBURY.

Inauguration of Horizontal Retorts.

The formal opening ceremony in connection with the new horizontal retort installation at the gas-works of the Dewsbury Corporation at Savile Town took place on April 19 in the presence of a large company. The plant has actually been in operation since last November, but the demand on it during the winter was such that it was not convenient to have the official opening until nearly five months afterwards, during which period the choice of the installation has been fully justified.

The specifications and plans were prepared by Mr. H. L. Bateman, Gas Engineer and Manager to the Dewsbury Corporation, and the work was carried out by Messrs. Gibbons Bros., Ltd., of Dibdale Works, Dudley. The combined retort charging and discharging machine, of the projector type, and the coke-handling plant, were supplied and erected by Messrs. Ride & Bell, Ltd., of Misterton. The installation cost about £33,000, but it involves no additional charge on the rates, the yield of gas per ton of coal carbonized being so much improved by the new plant that, with other savings from greater economy in general working, the interest and sinking fund charges on the loan can be met without call on the rates. The new plant was described and illustrated in last week's "Journal," p. 158.

The new works were declared open by the Mayor of Dewsbury (Alderman J. E. Kilburn, J.P.), and the party afterwards made a tour of inspection. They were conducted over the plant by Mr. Bateman and Mr. T. Anthony Canning (Assistant Engineer).

Luncheon was provided subsequently at the Town Hall by the Gas Committee. The chair was occupied by Alderman J. McCann, J.P. (Chairman of the Gas Committee).

After the Loyal Toast had been honoured,

Alderman McCann proposed "The Gas Industry," suggesting that the new works they had seen that day were an indication of the steady progress the gas industry was making. He was extremely proud of the installation. He was proud to have on his right-hand at that gathering the Mayor of Dewsbury (Alderman Kilburn), who was Chairman of the local Electricity Committee. In Dewsbury they had always worked on the principle that there was ample room in the public service for both gas and electricity. Indeed, at one period the two services were under one Committee. Both industries had one great purpose—service to the public.

Mr. C. S. Shapley (Leeds City Gas Engineer, President of the Manchester and District Institution of Gas Engineers, and President of the Institution of Public Lighting Engineers), responding to the toast, said he was proud of the gas industry. He was proud of the Institutions which he represented, and of the fact that only that week he had been deputed to represent the gas industry of this country at a forthcoming gas exhibition at Antwerp. He entirely agreed that gas and electricity undertakings, while rivals, should be friendly rivals. Competition, within reason, was good for all parties. It was only the ridiculous kind of competition that was good for nobody. He was delighted with the new plant at Dewsbury; and the Committee, the Engineer, and the consumers of Dewsbury were to be congratulated. He hoped it would produce all the results claimed for it; and he thought that under the management of Mr. Bateman it was likely to produce something even better than that.

Mr. F. H. Robinson (Engineer and Manager of the Harrogate Gas Company, and ex-President of the Manchester and District Institution) proposed the toast of "The Corporation and Gas Committee of Dewsbury." He remarked that opportunities given to gas engineers to inspect plants other than their own were productive of much good. The new installation at Dewsbury proved that the Gas Department were optimistic regarding the future of gas. When electricity was in its early days, it had been assumed by many that the days of gas were numbered. A wave of pessimism swept over the country, shareholders in gas companies sold out at ridiculous figures, and the lucky people who got shares at that time had since had reason to be thankful. These things came in cycles; and latterly there had been another wave of pessimism, due particularly to the Government's electricity proposals. History, however, showed that the greatest advances in the gas industry had been when electricity seemed to be gaining ground most rapidly. The gas industry had never developed so greatly as during the thirty years since the introduction of electricity, and particularly in the past ten years or so. There seemed to be no reason why the two industries should not advance side by side. He thought there was room for much more co-operation between them than existed. The new plant at Dewsbury was well laid out with a view to the future. They had an installation in half the original length of the house, and in the future would be able to turn out considerably more gas than before without a great addition to capital expenditure. This was greatly to the credit of the Engineer, and the enthusiasm, trust, and support given him by his Committee. There was a saying that profits were made in the retort house. It was true to-day to say that the distribution department was almost equally important in producing profits; but no amount of efficiency in distribution could neutralize waste in the retort house; and therefore at Dewsbury they had taken a wise step in seeing that the gas manufacturing processes were in perfect order.

The Mayor of Dewsbury, as Chairman of the Dewsbury Electricity Committee, said that the Electricity Department in that town had no feelings of ill-will towards the Gas Department. If they were competing with the Gas Department, they were competing for the production of all that was best and most useful for the people of the district. There was ample room for both industries; and if their rivalry comprised seeing which could excel in the production of essential public services, then it was a rivalry which could be contemplated without anxiety. He was delighted to know that the Gas Committee had put themselves into a position so that consumers could look forward to greater progress in the undertaking. They had a Gas Department which had shown the spirit of energy which, he thought, characterized all departments of the Corporation of Dewsbury.

Alderman J. Halstead, J.P. (of the Dewsbury Gas Committee), proposed "The Contractors." Mr. Halstead said he had been a member of the Dewsbury Gas Committee since 1910, and had been much interested in the various changes which had taken place during those sixteen years. It had been his privilege to sit under one Chairman of the Committee all that time, and the Committee had never had any desire to change their Chairman. He was convinced that in the next few years the Gas Department were going to do a great deal towards solving the smoke problem in their district. He hoped that in the near future every householder in the town would be persuaded to instal gas fires, cookers, &c., instead of continuing to use dirty coal fires. In the new work, he had been greatly impressed by the thoroughness of the Contractors.

Mr. Charles S. Bennett (Chairman and Managing Director of Messrs. Gibbons Bros., Ltd., the principal contractors), responding, said it was a great education to many members of gas committees to visit works and to realize something of the difficulties with which the gas-works staff had to contend. With regard to the new installation, his firm had done their best to erect a good plant. It was not for him, as a contractor, to talk about the merits or demerits of horizontals, verticals, or inclined retorts. Dewsbury were horizontally inclined (laughter), and he thought they had now an installation that would carbonize almost any class of coal. During the course of erection of the new plant his contact with Mr. Bateman had afforded him the greatest satisfaction. Any difficulties which had arisen had been met in the best possible manner.

Presentation.

Mr. Bennett then presented to the Chairman of the Committee a silver salver, and to Mr. and Mrs. Bateman a silver tea-set, as a memento of the occasion.

Mr. J. Ride (Ride & Bell, Ltd.), also responding to the toast of "The Contractors," endorsed the observations of Mr. Bennett as to smooth and happy working with Mr. Bateman and other officials of the Gas Department.

A special toast was given to Mr. Bateman.

The Chairman, responding to the presentation made to him, said he had forgotten to mention previously that, while they of the Committee were rejoicing that day with their Engineer and his fellow professional men, they had not forgotten that much of the success of the Department was due to the loyalty of their workmen, and that to mark the occasion every man would be given a day's holiday at the expense of the Department.

Mr. Bateman, expressing thanks for the presentation, said he would always remember with pleasure his association with the two firms of contractors. He paid tribute to the generous support and confidence given him by the Gas Committee, and said how much he appreciated the loyalty of his staff. In getting out the specifications for the new plant, he had had much helpful advice from Mr. Holland Booth, the Town Clerk.

Eastern Counties Gas Managers' Association.—The half-yearly meeting of the Association will be held in the Council Chamber, Town Hall, Ipswich, on Thursday afternoon, May 6, under the Presidency of Mr. Frank Prentice, Engineer of the Ipswich Gas Light Company. Mr. Prentice will deliver his address, and Mr. C. E. Wright will read a paper on "Gas Manufacture at Ipswich." Previous to the meeting, the members will be entertained at luncheon in the Co-Operative Hall, Carr Street, by the Chairman (Mr. Henry Woodall, M.Inst.C.E., J.P.) and Directors of the Ipswich Gas Company; and at the conclusion of the business tea will be served in the library, on the invitation of the Mayor (Mr. K. J. Badshah, O.B.E.) and Mayoress. The annual dinner will take place at the Crown and Anchor Hotel in the evening; and on the following morning the gas-works and the showrooms of the Company will be open for inspection.

Southern Association Visit to Bristol.—An attractive programme has been arranged by the Directors of the Bristol Gas Company, at whose invitation the members of the Southern Association of Gas Engineers and Managers will be visiting the home of their President (Mr. R. Robertson) on Friday, May 14. Members will assemble in front of the Gas Offices in Colston Street at 10 a.m.; and motor coaches will convey them, via the Canons' Marsh and Avon Street Works, to the Stapleton Road Gas-Works, and afterwards to the new stove and meter workshops in Barton Street. At the Royal Hotel, the visitors will be the guests at luncheon of the Chairman and Directors of the Bristol Gas Company; and the afternoon will be devoted to a drive to Chelvey (with a halt for an inspection of one of the pumping stations of the Bristol Water Company) and Clevedon, where tea will be served. The return to the Gas Offices should be completed at about 6.30.

NOTES ON NEW BOOKS.

O'CONNOR'S GAS ENGINEER'S POCKET BOOK.*

The title of this book suggests that it can be carried in the pocket. As a matter of fact, however, there would have to be a considerable change in current fashions before this could be done. O'Connor's Pocket Book is too well known to readers of the "JOURNAL" to require any introduction. The volume has been revised by A. T. Gilbert and H. B. Morris, and has been published as the Fourth Edition by Crosby Lockwood & Son. Following on the lines of former editions, the subject matter is treated in four parts—mathematical tables and general constructing memoranda, gas manufacture, distributing and selling gas, and testing notes and water gas practice. Regarding the mathematical tables in Part I., little comment is necessary, for, in spite of the progress made since O'Connor first compiled his handbook, twice two still make four. In this section a thousand-and-one practical details are given about the construction of retort houses, condensers, boilers, engines, pumps, exhausters, scrubbers and washers, purifiers, gasholders, and station meters. Twenty-five years ago O'Connor wrote that "a bricklayer should lay 1000 to 1500 bricks per day in mortar." This statement appears in the edition before us, and, strange to say, without any comment. Part II. deals with gas manufacture; and after reading through this, it is thought that much more revision is needed before it can be termed up-to-date. "Coal when exposed to the air changes in character, the change consisting in a diminution of agglomerating as well as of lighting power." This is the opening sentence of the section. Then, a few pages farther on, the following statement is encountered: "Coal carbonized at 2000° yielding 9800 c.ft. of 16·54 candle gas equal to 555½ lbs. illuminating matter, but if carbonized at 2160° will yield 11,000 c.ft. gas of 12 c.p. equal to 452½ lbs. illuminating matter." Such ancient material does not add to the value of what is supposed to be a modern gas engineer's handbook. In considering pyrometry, the following instructions are given for finding the temperature of a furnace (p. 235): "Weigh a piece of metal, place in furnace, withdraw when heated, and immerse in a known weight of water." Have we, then, to scrap our optical and radiation outfits, and our thermo-couples; and, instead, carry about with us cans of water and balls of metal? In Part II., considerable stress is laid on the fact that 1000 c.ft. of crude gas from Newcastle coal contains about 8 c.ft. of sulphuretted hydrogen. The statement first appears on p. 241, and is repeated on pp. 249 and 253. Regarding naphthalene, the conclusion is drawn by the authors of the volume under review that "it is better to have naphthalene on the works than in the district. . . . If gas is thoroughly dried, no naphthalene is deposited." In the same section, the remedy for boiler incrustations is given as two ounces of muriate of ammonia added to the boiler twice a week. Part III. is concerned with the distribution and selling of gas. The flow of gas in pipes is treated in a manner which leaves a good deal to be desired. Under the title "Points on Lighting," the following amazing statement is recorded in regard to superheated burners: "By heating the air and gas before combustion, the carbon particles are liberated earlier, and brought to a higher temperature; at the same time they are kept at this temperature for a longer period." In this section there is a comparison-graph of prices of gas in sterling and French monies. The nature of this graph, which could well have been omitted, is best indicated by mentioning that the prices of gas per 1000 c.ft. range from zero to 24s. Part IV.—"Testing Notes and Water Gas Practice"—would benefit from a still more drastic overhaul than has been given to it by the joint Editors. The "Tests of Coals," for example, are really not of very much value. We would not have it thought for a moment that the new edition of O'Connor's Pocket Book is not of considerable worth. It certainly will prove useful. Our criticism, however, is that its value would be greatly enhanced if the revision had been more drastic.

* "O'Connor's Gas Engineers' Pocket-Book." Fourth Edition, revised and brought up-to-date by A. T. Gilbert and H. B. Morris. Published by Crosby Lockwood & Son.

NEW EXPERIMENTS UPON THE COMBUSTION OF WELL-DRIED CARBON MONOXIDE-OXYGEN MIXTURES.

[In two papers (Parts I. and II.) under the above title, which appear in the current issue of the "Proceedings of the Royal Society," Prof. W. A. Bone and his collaborators (Messrs. F. R. Weston, R. P. Fraser, and D. M. Newitt) describe their new experiments, in which it is shown that the presence of steam is not essential to the ignition and explosion of carbon monoxide and oxygen, and that the two gases can, and do, combine without its intervention.]

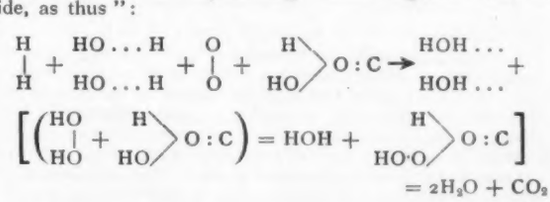
It is more than forty-five years since Prof. H. B. Dixon (in repeating Bunsen's experiments on the division of oxygen between carbon monoxide and hydrogen, when both are present in excess) discovered that a mixture of carbon monoxide and oxygen, dried by long contact with phosphoric anhydride, would not explode when sparked in the usual way in a eudiometer over mercury, although the presence either of moisture or of any gas containing hydrogen at once rendered the mixture explosive. Subsequent work by H. B. Baker has shown that the removal of moisture from other gaseous systems (*e.g.*, hydrogen and oxygen, hydrogen and chlorine, ammonia and hydrogen chloride, &c.) increases in an extraordinary degree their resistance to chemical change. There are, however, other well-established cases (*e.g.*, hydrocarbons and oxygen) in which similar removal of water makes no difference to the reactivity of the system.

The subject has naturally attracted much attention, because of its fundamental interest; and various explanations of the function of water have been put forward at various times. For some years after Dixon's discovery in regard to carbon monoxide, purely chemical explanations, involving the idea that steam molecules act as "carriers of oxygen" to the combustible gas, were most in favour. Thus Dixon himself at first supposed that, in the combustion of carbon monoxide, steam acts catalytically as follows:

$$\text{(i.)}\quad CO + OH_2 = CO_2 + H_2;$$
$$\text{(ii.)}\quad 2H_2 + O_2 = 2H_2O.$$

In 1886, however, Dixon observed that, in the explosion of cyanogen with twice its own volume (or more) of oxygen, "the formation of carbonic acid is complete, and is not affected by the presence of water;" and ten years later, in conjunction with Strange and Graham, he made certain further observations upon the flames of such explosions which led him to conclude that "in a mixture of freshly formed carbon monoxide and oxygen, these gases unite as the mass cools down without the intervention of steam, and where steam is present it does not appreciably alter the time during which the change continues." Indeed, in a recent private communication to Prof. Bone, after the publication of Mr. F. R. Weston's paper upon "The Flame Spectra of Carbon Monoxide and Water Gas" in the "Proceedings of the Royal Society" (A., Vol. 109, pp. 176-186 and 523-526), Dixon said: "I have long been sure that CO can unite directly with oxygen—as it does in the cyanogen reaction where CO is the first product, and as it must do largely in your high-pressure explosions."

H. E. Armstrong, who always contends that chemical interactions cannot occur between two perfectly pure substances, but require the conjunction of an electrolyte to form "a closed conducting circuit," takes the extreme view that water (which he regards as being rendered conducting by association with some traces of an electrolytic impurity) is *essential* to the combustion of carbon monoxide. He has recently declared carbon monoxide to be "*per se* an incombustible gas," and that probably "when a moist carbon monoxide mixture is sparked or fired, some hydrogen is decomposed and sufficient hydrogen set free to act in a 'depolarizing' circuit together with the oxide, as thus":



$$= 2H_2O + CO_2$$

Prof. Bone and his collaborators were led to make the "new experiments" recorded in these papers because of their inability to reconcile the extreme view that the presence of steam is *essential* to the combustion of carbon monoxide either with their experiments upon the explosion of carbon monoxide-air mixtures at high pressures, in which it was shown that the presence or otherwise of water vapour had little or no influence upon the rate of pressure development, or with the spectroscopic evidence derived from the study of carbon monoxide and water gas flames, which (as H. B. Dixon agrees) clearly showed

"that in an ordinary CO flame both the direct and indirect actions are going on at once."

The new evidence now submitted in these papers by Prof. Bone and his collaborators comprises four independent sets of experiments. It is impossible in this review of them to give the details of the experimental procedure, upon which the greatest possible care in every particular was bestowed, as anyone will realize who reads the account given of them in the original publication. Some of the experiments were witnessed by Profs. H. E. Armstrong, H. B. Baker, A. Smithells, Sir Robert Robertson, and other chemists interested in the subject. And whatever may be the true interpretation of them, there can be no reasonable doubt as to the new facts which the experiments have disclosed.

In the first series of experiments it is shown that as water vapour is progressively removed from a $2CO + O_2$ mixture, its "ignitability" by condenser discharge sparks (at 110 volts) rapidly diminishes; the "minimum spark energy" necessary to fire it increasing until, with a calcium chloride dried mixture, it becomes something like twenty or thirty fold as great as that required to fire the same mixture when saturated with moisture at a temperature of 15° C. Thus, whereas the "minimum spark energy" required to ignite a $2CO + O_2$ mixture saturated with water at 15° C., and at atmospheric pressure, is about 0·005 Joule only, no less than 0·126 Joule is required to fire a calcium chloride dried mixture at the same pressure.

In the second series of experiments it is shown that a $2CO + O_2$ mixture which has been reduced to "Bakerian dryness" by six months' drying in contact with pure phosphoric anhydride can be exploded at atmospheric pressure by a sufficiently powerful condenser discharge. The "minimum spark energy" required, from a condenser charged up to 970 volts, was found to lie somewhere between 0·235 and 0·362 Joule. But at such extreme dryness, even when the spark energy exceeded the said minimum, though the mixture instantly exploded, and the resulting flame spread rapidly through it, completely filling the vessel faster than could be followed by the eye, its resistance to combustion was still so great that an appreciable amount of it remained unburnt. Thus with an igniting spark-energy of 0·365 Joule (*i.e.*, just above the minimum required) only 75 p.ct. of the mixture combined in the resulting explosion; and on increasing the igniting spark-energy to 2·35 Joule, about 88 p.ct. of the mixture combined in the explosion. It is thus shown that there is some property of the condenser discharge, presumably its ionizing power, which, if only developed strongly enough, can overcome the high resistance of such extremely dry $2CO + O_2$ mixtures to ignition and explosion. Moreover, conclusive proof is given that the "resistance to combustion" of such P_2O_5-dried mixtures is considerably greater than that of $CaCl_2$-dried mixtures, as regards both the "minimum spark energy" required for ignition and the percentage of combustion which occurs during the resulting explosions.

In the third series of experiments, it is shown that an increase in pressure increases the ignitability of P_2O_5-dried $2CO + O_2$ mixtures by means of sparks of ordinary intensity, such as those obtained with a $^1/_{100}$-in. spark-gap from a 1-in. Marconi induction coil with a current of 6 volts in the primary circuit. Thus, whereas a mixture of the gases which had been dried over pure phosphoric anhydride for a whole year could not be fired at atmospheric pressure by the said sparking device, it was always fired at first shot by the same spark at pressures of 5 atm. or more. The combustion in the resulting explosion was, however, only 93 p.ct. complete when the initial pressure was 5 atm., although at 10 atm. it was 99 p.ct. complete.

In a final series of experiments, spectrograms were obtained of a P_2O_5-dried CO-air explosion flame fired at an initial pressure of 25 atm. in a cylindrical steel bomb fitted with quartz windows. These spectrograms (two of which are reproduced in the paper) show the entire absence of any "steam lines." The spectrographic evidence thus seems to be conclusive against anything which postulates that water vapour *necessarily* plays an intermediary *chemical rôle,* involving the decomposition and regeneration of steam, in the combustion of carbon monoxide.

In the concluding section of the papers, after summarizing and reviewing the new experimental evidence, the authors remark that, although the idea that the presence of steam is *essential* to the combustion of carbon monoxide may now be set aside, they would not be justified in putting forward any new theory as a proven one, as yet. That carbon monoxide and oxygen can, and do, interact indirectly, without any intervention of steam, may, however, now be considered as proven beyond any reasonable doubt; and it is the radiation excited by the direct CO-oxygen interactions in a CO flame which give rise to its characteristic colour, and to the continuance and banded parts of its spectrum. Many considerations incline the authors to think that the true explanation of the combustion of carbon monoxide will ultimately be found in the ionization of one (or both) of the combining gases as a necessary precedent to their combustion, and that steam, besides acting chemically when present in sufficient concentration, may also promote such ionization, even when present in much smaller quantities, by virtue of its high specific inductive capacity; or, possibly, by condensing upon the free negative electrons in an "ionized" mixture it may hinder their recombination with the positive CO ions, and so prolong the "reactivity" of the system.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

[This was a "short paper" meeting. Mr. F. C. Whimster, of Tottenham, emphasizes the need for looking after the lighting load, and deals with the value of maintenance in this direction. Mr. M. Walker, of the North Middlesex Gas Company, in a paper on sulphate of ammonia, confines himself to the indirect process, and brings forward many points of importance in the working of the plant.]

A Meeting of the Association was held at the Westminster Technical Institute on April 23—Mr. W. L. Westbrook, of the North Middlesex Gas Company, presiding. Two short papers—one of particular interest to distribution men, the other to those engaged on the manufacturing side of the industry—were read. The first was by Mr. F. C. Whimster, of Tottenham; and in the absence of the author, it was read by Mr. W. R. Moger, also of Tottenham.

MAINTENANCE OF PRIVATE LIGHTING.

By F. C. Whimster, of Tottenham.

When maintenance of any kind is mooted, almost the first question that is raised is one of cost—"Will it pay?" I do not want to dwell on the financial side of this subject so much as to emphasize the importance, now more so than ever, and trust that my suggestions may be viewed in the way in which they are intended—viz., to enable the gas company to give to the consumers that which is very essential—service.

Most of us in the gas industry are aware of the importance of maintaining cookers, geysers, and other appliances; but we must realize the great necessity of maintaining one of our large sources of consumption—private lighting.

Organization is the soul of business; and thus a scheme must be organized to meet the needs of the various companies and districts. A superintendent is necessary, and a staff of fitters detailed specially and solely for this work. The fitters must be of good address, and as educated as possible, because they are in direct contact with consumers, and must of necessity be able to interest and talk confidently of different matters pertaining to the use of gas and appliances, in addition to burners, mantles, and globes. They should endeavour to interest consumers in differentiating between good and bad burners and mantles.

With regard to charges, this can only be worked out according to locality and circumstances. Generally speaking, however, ten and less burners in a house could be maintained free of labour cost; a charge only being made for material used. Above this figure, a charge of 1s. 6d. might be made per burner per year. A call should first be made to inspect all fittings, and the consumer should be advised as to replacement of all obsolete and unsafe fixtures. After this a call might be made (say) four times a year. A good fitter should be able to adjust 80 to 120 burners per day.

The number of calls made and work done should be recorded by the superintendent, and any inquiries made by the consumer about other appliances could be passed through to the proper channel, for a representative to call.

A stock account would of course be kept, and all material used, broken, and returned entered day by day, as well as an account of all money paid or to be charged. By these records, which can be scrutinized at any time by the chief official, it will be shown that maintenance carried out properly is a scheme which justifies itself in the reduction of complaints, and the installation of further apparatus.

Further to this scheme, which should be advertised by a series of talks in the local paper, attractive display advertisements should demonstrate the efficacy of gas for lighting, and point out the advantages of having distant control, &c. The efficiency of scientifically constructed burners, and their effect on ventilation, and the light-diffusing properties of globes of various material and colour should be explained to the public, who will first have a slowly increasing curiosity, and then an interest in their lighting.

Another sphere is in new buildings. The builder and architect should be visited as soon as a new building or house is

proposed. They should be advised, and, if at all possible, shown the latest and best lighting fittings. Doctors exercise a great influence over their patients, so this is another channel through which to interest the public. In my opinion all doctors and public men should be given free maintenance and immediate attention. Then when new appliances are put on the market, their attention may be drawn to them.

With regard to shops, these are in most cases adequately maintained, but it must be remembered that consumers may be influenced by seeing shops well lighted by gas, and a free advertisement like this is of inestimable value.

While speaking of advertisements, burners are very seldom advertised compared with mantles. Mantle manufacturers advertise so well both through the Press and by poster. In this respect we are no doubt losing a lot of influence, especially as our electrical friends advertise extensively, and generally with very good taste.

Showrooms should be more tastefully decorated, and should not resemble an ironmonger's shop. They are also advice bureaux; and here a good opportunity occurs for the showroom attendant to press better lighting on the consumer, and dwell on the hygienic aspect, rather than on the comparison in cost with electric lighting.

Maintenance men should be encouraged to visit the showrooms, and become conversant with all new fittings, so that they will be able to advise consumers. This exemplifies the need for keen and observant fitters, otherwise part of the good will be nullified.

Heating and cooking follow lighting, so it behoves us to obtain the highest efficiency possible from our burners and mantles. We have progressed from flat flame to superheater burners; but there is still much to be done in improvements. There is a general tendency to think that anything is good enough for gas; and the only consideration when the majority of people buy a burner is cheapness. Even in gas employees' houses I have seen that horrible inverted adaptor burner with the air holes blocked up with pieces of paper, when by paying a couple of shillings more, they could have obtained a very good burner. What is more, the company would have obtained another satisfied consumer.

The consumer should be informed of the difference in the light obtained by being able to regulate a burner provided with an adjustable nipple and substantial air regulator, and the common fixed nipple kind with its ugly air regulator.

With regard to mantles, a comparison between a well made and cheap mantle will usually astonish a consumer who is not interested in its manufacturing processes or constituents, but who will readily perceive a badly shaped mantle with a bead or pip at the bottom to be inferior to a mantle which is symmetrically fashioned to enclose the bunsen flame of the burner.

Those of this Association who visited the Welsbach works some time ago will, of course, understand something of the process of making mantles, and the careful inspection to which each mantle is subjected. They can therefore realize that a mantle produced under such conditions must of necessity yield better results than one made in less favourable circumstances, and not subjected to any severe tests. It cannot be too strongly pointed out to the consumer that it pays him to buy only the best mantles.

To obtain our maximum lighting load, we must, in brief, formulate a plan of maintenance, preferably as detailed by Mr. Browne in his masterly paper, "Premise and Promise," given before this Association this session (see GAS JOURNAL," Vol. 172, p. 785); and then educate the consumer up to a standard which will enable him to appreciate the necessity of having such a scheme in operation.

Though I have not outlined any definite scheme of maintenance in this paper, I have tried to include many of the little things which if omitted might make success harder of attainment, and when included may very well render a satisfied consumer more satisfied.

Discussion.

The CHAIRMAN said that all present would agree as to the great value of maintenance of lighting. It was true that the rapid growth of the gas industry was due to the ever-increasing demands for gas for cooking, heating, and hot water heating, yet the lighting load was an important one, and every effort should be made to retain it. He thoroughly agreed with the author that they should make the best use of their showrooms. Stress should be laid on the high intrinsic brilliancy of electric light compared with that of gaslight. It was because of this, said Mr. Westbrook, that not very long ago the workers in a certain post-office put forward to the authorities a petition asking that the electric light should be substituted by gas. For outside lighting, gas was undoubtedly superior to electricity. Gas-filled lamps did not compare with superheated burners; and after a short period of use the efficiency of the former fell off rapidly. On the other hand, superheated burners retained their high efficiency practically indefinitely. A considerable number of consumers in Finchley were contemplating changing over from gas-filled lamps to the latest type of superheated burner. In some instances, indeed, electricity had been ousted. To retain and extend the lighting load, it was essential to have an efficient system of maintenance, and it was necessary to have dependable men for the work.

Mr. F. HOLLAND (North Middlesex) was also of opinion that for outside lighting gas was far better than electricity, and that maintenance of private and shop lighting was necessary. In his Company it had been found that the method of charging so much per burner was not as good as charging for the men's time and the material used.

Mr. A. T. LILLEY (North Middlesex) preferred burners with perforated steatite nozzles to those which incorporated iron gauze. With the former it was much easier to keep the burners clean.

Mr. T. H. PRATER (Tottenham) wondered why greater use was not made of distance control, for there was little doubt that one reason why electricity was preferred was because of the convenience of the electric switch. Perhaps Mr. Moger could tell them whether the gas switch was satisfactory. On the subject of cleaning burners, he thought that when maintenance men were on the district they could point out to consumers that blockage due to the accumulation of dirt could easily be remedied by projecting the pin through the orifice.

Mr. HOLLAND thought that insufficient use was made of illuminated signs worked by gas. As for cheap burners, these should on no account be purchased.

Mr. W. L. SUTTON (South Suburban) remarked that gas switches were satisfactory. What militated against their greater employment was their cost.

Mr. A. BROADBENT (Senior Vice-President) asked whether the Tottenham Company offered consumers any special inducement to scrap inferior burners and replace them with efficient ones supplied by the Company.

Mr. LILLEY asked Mr. Moger whether he had found slight leakages at the valve of the pneumatic switch.

Mr. MOGER, replying, said he agreed that perforated steatite discs were preferable to gauzes. The latter deteriorated rapidly, and dust soon collected on them, which was not the case with the discs. As for the gas switch, they were installing a considerable number of the pneumatic type; but he, too, thought the price was against their general adoption. If the manufacturers could turn them out cheaper, there was no doubt that they would be more universally employed. In many instances it was the gas switch which had prevented consumers from changing over to electricity. If these switches were properly maintained, they were very satisfactory, and failures were few. He had met with cases where there was a smell at the valve, but this was easily cured by changing the valve. As for cheap burners, the Tottenham Company had a special inducement for their consumers to do away with their shoddy burners, and replace them with efficient ones. The Company supplied a first-class burner at the low price of 2s. 6d., fixed free. Regarding the maintenance of lighting in public buildings, he agreed with the author of the paper that a charge should be made. Discretion should be used when dealing with private lighting. In any case, private consumers ought to be visited at least once a month, and shopkeepers, &c., at least once a fortnight. Good shop lighting was an excellent advertisement for any gas undertaking.

NOTES ON SULPHATE OF AMMONIA.

By MAURICE WALKER, of the North Middlesex Gas Company.

The whole subject of sulphate of ammonia, comprising the various processes of manufacture, methods of working plants, and subsequent treatment of the salt, is one of great interest; but the scope is rather too wide for a short paper. The author will therefore confine himself to the "indirect" process, and endeavour to bring forward some points of importance in the working of the plant, having regard to the required chemical and physical characteristics of the salt.

In the first place, before remarking upon the process of manufacture and the method of working, it is desirable—indeed, necessary—to know the characteristics the salt must possess in order to compete successfully in present-day markets. These may be set out as follows:

(1) High nitrogen content.
(2) Low moisture content.
(3) Neutrality.
(4) Large crystals.
(5) Freedom from hard lumps.
(6) Reasonably white colour.

The chief use of sulphate of ammonia, both at home and abroad, is as an artificial manure. It is employed either alone or mixed with other chemicals, chiefly phosphates. Chemical manures function by adding nitrogen and phosphorus to the soil. This explains the desirability of a high nitrogen content. The higher this is, the higher the price obtainable. Pure sulphate, absolutely dry, contains 21·2 p.ct. of nitrogen. The commercial article varies considerably in purity, and is never absolutely dry. It is therefore generally sold upon a nitrogen percentage basis. The standard taken by the British Sulphate of Ammonia Federation is a maximum of 21·1 p.ct. of nitrogen in the case of neutral quality, and a maximum of 20·7 p.ct. in the case of the ordinary or acid quality.

The prices ruling in the Federation for March, 1926, were a maximum of £13 1s. per ton for neutral quality, and £11 18s. for ordinary quality. Neutral quality must not contain more than 0·025 p.ct. of free acid; and if not free from lumps, a reduction of 9s. per ton is made. Reductions of 1s. 6d. per ton are made for each complete 0·1 p.ct. of nitrogen below the standard. This applies to either quality.

The standards are high; and to obtain top price it is essential to neutralize. The figures are on the wet basis, so it is

necessary to dry the salt as thoroughly as possible before dispatch. The least moisture figure it is practicable to obtain on the salt leaving the works is about 0·2 p.ct.

There is practically no sale for acid sulphate at the present day. An excessive amount of free acid in the salt—say, above 0·1 p.ct.—rots the bags in which it is delivered, resulting probably in a considerable loss in weight to the customer when the consignment finally reaches him. Furthermore, excess acid has a "souring" effect upon the soil, thereby rendering the salt prejudicial, instead of beneficial, to the production of crops.

Where sulphate is used as a manure on a large scale, it is applied to the soil by sowing "drills;" and complaints have been received owing to the crystals being so fine that the salt blew away in windy weather, before it reached the ground. This is an instance indicating the desirability of large crystals; but it is the effect of the size of crystal upon the caking of sulphate that is of most importance. A great bugbear, both to manufacturer and customer, is the caking of ammonium sulphate into large lumps, so hard that they have to be broken-up with picks. This means increased cost of production, and a reduction of 9s. per ton in the sale price.

In the Fifth Annual Report of the British Sulphate of Ammonia Federation, published in the "Gas Journal" for Nov. 18, 1925, it is stated with regard to caking that "this vexatious difficulty has resulted in the loss of 57 p.ct. of the Japanese trade, and it is therefore impossible to overstate its importance." Examination of the reasons for caking will show the influence of characteristics (2) and (4), and emphasize their desirability.

Cause of Caking.

When a heap of salt dries, the moisture, which is really a saturated solution of ammonium sulphate, evaporates, depositing fine crystals which form a cementing bond between the crystals of the main body of salt. Caking is therefore primarily due to loss of moisture. The author was much interested in reading the paper on "Caking of Sulphate of Ammonia," by Mr. G. J. Greenfield, published in the "Gas World" for March 6, 1926. The many conditions contributing to caking are carefully and fully set out therein. Let us briefly discuss a few of them.

Moisture.

There are two ways of reducing the effect of loss of moisture causing caking:

(1) To dispatch the salt with a small moisture content—say, 1·5 to 2 p.ct. This should ensure sufficient saturated solution upon the surface of the crystals to prevent any deposited crystals having a cementing effect. This means a sacrifice in the nitrogen content.

(2) To dispatch as dry as possible. In this case, moisture must first be taken up before it can be given off to cause caking.

Presence of Acid.

With regard to the effect of free acid upon caking, experience seems to vary somewhat. Conditions vary on different works. The amount of free acid present, the temperature and method of drying, the percentage of moisture, the size of crystal, &c., all contribute to give divergent experiences. In the days before neutralizing came into vogue, the salt, containing about 0·5 p.ct. of free acid, always caked rock hard when stored in a heap for any length of time. Theoretically, the presence of acid would encourage caking. This is owing to the fact that acid salt absorbs moisture more readily than neutral, and therefore the possibilities of caking are increased. The author can say, however, from his own experience and from that of certain others, that the presence of a small amount of acid up to 0·1 p.ct. decreases the tendency to cake. In one case, salt containing 0·1 p.ct. of free acid and about 1 p.ct. of moisture was stored in a heap, and no caking occurred. The crystals were fairly large. In another case, neutral salt containing about the same percentage of moisture caked badly. In this case the crystals were not so large.

Size of Crystal.

This brings us to the effect of the size of crystal. With large crystals there is less area of contact between them, and therefore less chance of their cementing together. Also, the salt will be less hygroscopic, and, if well dried before dispatch, there is less likelihood of caking occurring through moisture being alternately received and given off.

The author made an experiment upon three small bags of sulphate A, B, and C. The contents of the bags were as follows:

A. Un-neutralized salt dried by natural drainage.
B. Un-neutralized salt washed with hot water and dried by whizzing in a centrifugal machine.
C. Salt washed with hot water, neutralized with weak ammonia solution, and dried by whizzing.

Analysis, P.Ct.

—	A.	B.	C.
Nitrogen (wet basis)	20·45	20·63	20·74
Nitrogen (basis of 0·2 p.ct. H_2O)	20·95	20·93	21·08
Moisture	2·58	1·65	1·83
Free acid	0·46	0·08	*Nil*

Each bag contained about 14 lbs. of sulphate, and was put under a pressure of 1 cwt. for 2 days. The crystals were not very large. After the experiment, A was free, B had caked but was easily broken, and C had caked rock hard. The experiment proves nothing; but it is of interest to note how the small amount of free acid seems to prevent serious caking. Unfortunately, it is not a practicable solution of the problem, owing to the restriction of 0·025 p.ct. of free acid in order to qualify for neutral quality salt.

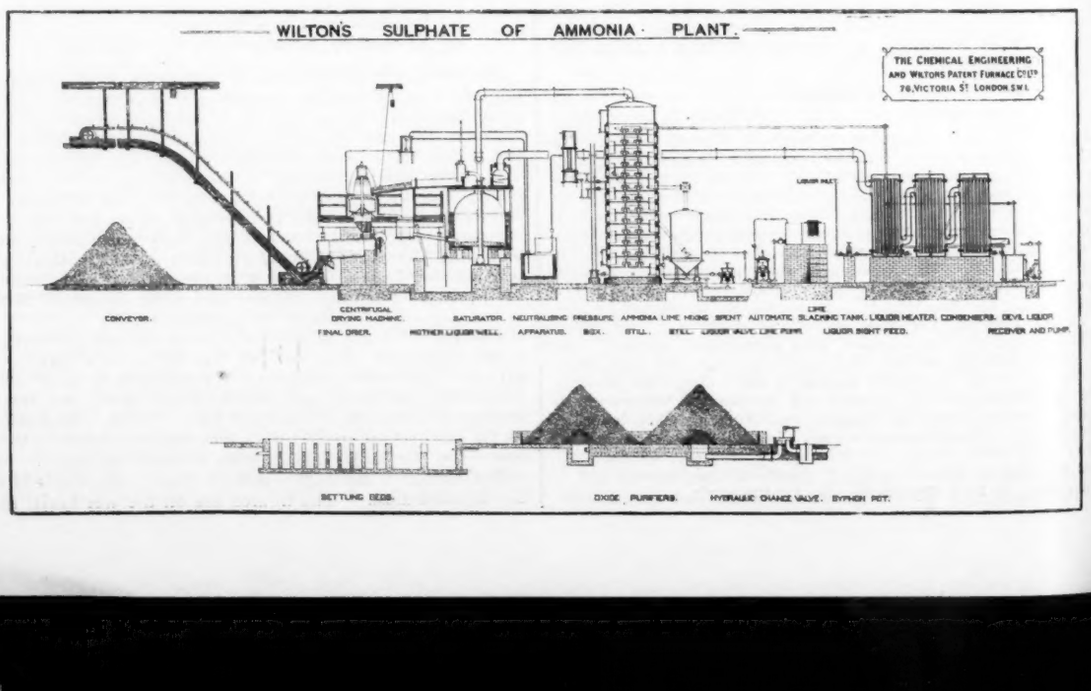
The nitrogen figures illustrate the need for neutralization if the standard of 21·1 p.ct. of nitrogen is to be even approached. It is not always easy to maintain 21·1 p.ct., but with careful working on a modern plant the nitrogen content should never fall below 21 p.ct. Other factors affecting caking are the drying process, temperature of drying, and the presence of impurities which may be introduced in the neutralizing process. These will be mentioned later.

Manufacture.

The bulk of the sulphate of ammonia manufactured in gas-works is produced by the "indirect" method—that is to say, the ammonia is first recovered from the gas in the form of ammoniacal liquor. The liquor is worked up to a suitable concentration—say, 8 to 10 oz. strength—and the ammonia is again recovered by distillation with steam and alkali, and caused to combine with sulphuric acid, forming the sulphate. Thus the process is truly "indirect." The plant will be so familiar to the majority that a detailed description of it is unnecessary. The diagram shows a modern plant.

Raw Materials.

One of the fundamental points to be observed in the satisfactory working of the plant is the purity of the raw materials ammoniacal liquor, sulphuric acid, and lime. This may ap-



pear to be an elementary statement, but, as is the case with every plant and process, careful attention to simple elementary details is well repaid. Ammoniacal liquor should be absolutely free from tar, otherwise trouble is sure to occur through clogging of the sight feed; and if tar gets forward into the still, the latter will require more frequent cleaning out and, in addition, the job will take longer. Furthermore, tarry matter in the liquor is the chief cause of the objectionable odour of pyridine frequently noticed in sulphate works. All traces of tar may be eliminated by filtration of the liquor through coconut matting.

Acid should be comparatively free from iron and arsenic. Suspended matter and dark colour are relatively unimportant, but the former may be removed by filtration through ballast. The presence of iron and arsenic may result in discoloration of the sulphate.

Arsenic causes yellow and orange discolorations by the combinations of arsenic acid with sulphuretted hydrogen forming arsenic trisulphide and arsenic pentasulphide—

$$H_3AsO_4 + H_2S = H_3AsO_3 + H_2O + S$$

and

$$2\,H_3AsO_3 + 3H_2S = As_2S_3 + 6H_2O$$

(Arsenic trisulphide, yellow.)

also

$$2H_3AsO_4 + 5H_2S = As_2S_5 + 8H_2O$$

(Arsenic pentasulphide, orange.)

The remedy is only to use acid made from spent oxide.

Iron may cause a yellow discoloration after the salt has been in store for some time. This is due to the oxidation of ferrous sulphate, from the iron in the acid, to ferric sulphate.

$$4FeSO_4 + 2H_2SO_4 + O_2 = 2Fe_2(SO_4)_3 + 2H_2O$$

(Ferric sulphate, yellow.)

Lime should be free from sand and unburnt limestone; the former clogging the lime still, and the latter jamming the clack valves of the lime pump. The percentage of calcium oxide should not be less than 85. It is generally between 85 and 95. The quantities of raw materials required for the production of one ton of sulphate approximate to the following:

Liquor	3400 gals. at 8 oz. str.
Acid	18 cwt. at 80 p.ct. H_2SO_4
Lime	3 cwt.

Sulphate of ammonia plants have been so much improved in the last few years that almost all nowadays possess the recognized features of a good installation. These have been stated as follows:

(1) Ability to make sulphate which is saleable in the best markets.
(2) Maximum make of sulphate from the liquor and acid used.
(3) Simplicity of operation.
(4) Ease of cleaning.
(5) Low cost for labour, fuel, and maintenance.

The results obtained will therefore depend upon the supervision exercised in the working. The control is exercised with due regard to economy and to the desirable characteristics discussed. Economy is obtained by smooth working of the plant and careful attention to the points where ammonia may be lost or acid wasted. The former may be effected by ensuring the purity of the raw materials, as previously stated, and the maintenance of all apparatus in a cleanly condition.

Plant Losses.

Ammonia may be lost at seals, open tanks, or in the pumping of liquor. The chief losses, however, occur in the spent liquor and waste gases. The ammonia in the spent liquor should be kept down to 0·02 p.ct. To ensure this, the liquor supply should be constant, and the lime pump must supply an adequate quantity of lime steadily and continuously. The following formula may be useful for calculating the amount of lime required to remove the fixed ammonia:

$$\text{Lime required, lbs. per hour} = \frac{OS \times 0{\cdot}3469 \times L \times 1{\cdot}65 \times 100}{16 \times P}$$

Where: OS = Oz. str. of liquor due to fixed NH_3
L = Gallons of liquor per hour
P = Percentage of lime as CaO

This gives the theoretical quantity of lime required. It is generally found necessary to employ a considerable excess. The quantity of liquor passing through the still per hour varies with the size of the installation and the ounce strength of the liquor.

To prevent loss of ammonia in the waste gases, attention must be paid to the saturator. This brings us to what is perhaps the most important point with regard to the quality of the salt produced. The saturator liquid must be kept at a fairly constant strength—say, about 58° Twaddell. The acid supply should always be by gravity from an overhead tank, to ensure a steady pressure. The regulation of the acid feed is really the most difficult part of the sulphate maker's job. It is purely a matter of experience and practice in getting just the right feed to produce a good firm white salt of large crystal grain. It is so easy for the operator, while attending to other duties, to overshoot the mark in either direction. If the strength of the bath is allowed to fall (say) to below 57° Twaddell, the salt does not separate out, as all the acid is used up before the liquor is saturated with ammonia. This results in loss of ammonia in the waste gases. Loss in this way may be minimized by having a small acid scrubber on the waste gas outlet from the saturator, and returning the liquor to the saturator. Shortage of acid also results in discoloration of the salt. In the first stages, the salt turns a dirty grey colour, and below 56° Twaddell local alkalinity may occur, resulting in blue salt. The blue colour is due to the formation of ferrous ferrocyanide, which becomes oxidized to ferric ferrocyanide when the salt dries. The reaction takes place between ammonium cyanide, due to the local alkalinity and ferrous sulphate from iron in the acid:

$$6NH_4CN + FeSO_4 = (NH_4)_4\,Fe(CN)_6 + (NH_4)_2\,SO_4$$

$$(NH_4)_4\,Fe(CN)_6 + 2FeSO_4 = Fe_2\,Fe(CN)_6 + 2(NH_4)_2\,SO_4$$

$Fe_2\,Fe(CN)_6$ oxidizes to $Fe_4(FeC_6N_6)_3$

(ferrous ferrocyanide) (ferric ferrocyanide, prussian blue)

This blue discoloration may also be caused by priming-over of ammoniacal liquor from the still into the saturator, due to the former becoming clogged and in need of cleaning out. Too much acid will cause the salt to be deposited very rapidly at first, resulting in small crystals and a sloppy mess containing a large excess of free acid. In a short time the "make" will be stopped and the contents of the saturator must "boil down" until all the acid is again saturated. In this event the acid feed should be stopped altogether until the Twaddell of the bath is reduced to 58°. The strength of the bath should not be allowed to exceed 60° Twaddell. The most suitable strengths at which to work the saturator vary somewhat with different plants, but the figures mentioned apply to the majority. Irregular acid feed always results in wastage of acid. The percentage of nitrogen in the salt is, of course, controlled by the conditions in the saturator and the purity of the raw materials.

With regard to the control over the size of crystal, everything depends upon the rate of crystallization. The slower the rate, the larger the crystals. In the case of the closed type of saturator, the salt can remain in contact with the mother liquor for a longer time than is possible with the open hand-fished type. This allows opportunity for the crystals to grow. There is the possibility of improvement in the design of saturators with a view to effecting this in a greater degree, though some types, notably the Wilton, do produce very large crystals at the present time.

Waste Products.

The disposal of the waste products from a sulphate of ammonia plant is always more or less a source of trouble and expense. Labour charges are incurred periodically in cleaning out of spent liquor settling beds. These may be obviated by the use of soda ash instead of lime for the removal of the fixed ammonia. Soda ash offers other advantages in that its use greatly reduces trouble due to blockages in the still and in the liming system. Its high price, however, in comparison with lime, prohibits its use in most cases. The prejudicial effects of spent liquor upon sewage, in its chemical treatment, has caused considerable trouble and expense to gas companies in the last few years. The cause of this trouble, and the various means of overcoming it, form a very large and interesting subject.

The condensate from the waste gases, known as "devil" liquor, is usually dealt with by returning it to the still with the ammoniacal liquor. Most of the smell is thus removed, and it leaves the plant with the spent liquor. There are three methods of dealing with the waste gases, which consist chiefly of carbon dioxide, sulphuretted hydrogen, and cyanogen compounds. These methods are as follows:

(1) Conversion into sulphuric acid.
(2) Conversion into sulphur in a Claus kiln.
(3) Absorption by oxide purifier.

Methods (1) and (2) are only suitable for the largest works; method (3) is the simplest, and is suitable for all small and medium sized works. The lay-out is inexpensive, as there is no need for purifier boxes. The waste gases are led under the centre of a layer of oxide of iron spread out on a concrete floor. The gases permeate the heap, and the sulphuretted hydrogen and cyanogen compounds are removed in the ordinary way. The provision of two purifiers and a suitable change-over valve to allow for revivification of the fouled heap is all that is required. The fouled heap may be revivified in a day or two by occasional turning over of the oxide by hand.

Neutralization and Drying.

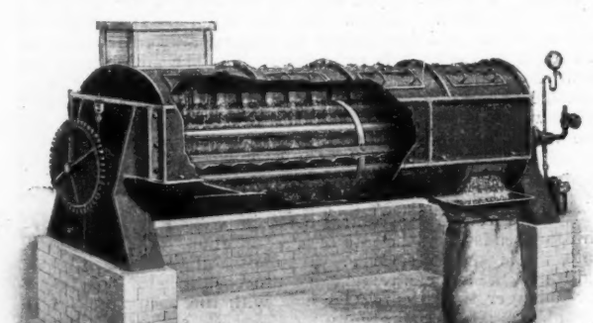
Preliminary drying by freeing the sulphate from mother liquor and excess acid is generally effected in a centrifugal machine. Neutralization may be most conveniently carried out by spraying the salt with a weak solution of ammonia while the whizzing is in progress. The ammonia solution may be obtained by taking a small supply of ammonia gas from the "fixed" still, and passing it into water or mother liquor.

Some installations have a small household ammonia plant generating ammonia from mother liquor, or old scraps of sulphate and lime. This forms a convenient source of neutralizing liquor. About 1·5 gallons of a 0·2 to 0·3 p.ct. solution of ammonia per cwt. of sulphate containing 0·4 p.ct. of free acid is sufficient for neutralization. Another method of neutralizing is by adding powdered ammonium carbonate to the salt during the whizzing. The amount required is 6 to 7 lbs. per ton of sulphate. Both these methods of neutralization are equally satisfactory in that both effect complete neutralization and increase the nitrogen content of the salt. The first method is the cheaper, and has an added advantage in that it does not introduce an impurity into the sulphate.

Soda ash, either in powder form or in solution, and lime in powder form, may also be used for neutralizing. The drawback to these reagents is that they do not increase the nitrogen content (in some cases they may reduce it), and also that they introduce impurities in the form of hydrates, which may give up their water to the sulphate, and thus increase the tendency to cake.

Final drying of the salt may be effected on a hot plate drying table, a steam-heated hot air drier of the Wilton type, or a hot air tower. It is an essential point that the crystals be not broken during the final drying, otherwise it is useless to attempt to produce large crystals. Breakage of the crystal in itself may also be a cause of caking, in that it gives rise to moisture due to " bleeding " of the crystals.

The diagram shows a modern form of steam drier.



With regard to the temperature of drying, it is not advisable to dry at a temperature exceeding 135° C., owing to the risk of dissociation of the sulphate with the consequent formation of sulphuric acid. This might be a cause of caking. It is well-nigh impossible to guarantee that caking will not occur during transport or storage of the sulphate by a customer, but research work, rendered imperative by the loss of trade sustained, has resulted in the possibility of the production, by the " indirect " process at any rate, of a salt which will not cake under all ordinary conditions of works storage.

In conclusion, the author tenders his thanks to the Chemical Engineering & Wilton's Patent Furnace Co., Ltd., for the loan of the diagrams reproduced.

Discussion.

The Chairman congratulated Mr. Walker on his paper, and said there was no question that a clean, dry salt of good colour assisted in the marketing of sulphate. Any improvements in manufacture would render the product of greater value.

Mr. Prater said he had been impressed by the author's reference to a small acid scrubber on the waste gas outlet from the saturator. He had not seen this arrangement, but he imagined that if some of the acid were by-passed into the seal, it could be added again to the saturator in the ordinary way. The greatest loss of ammonia occurred in the devil liquor. In most places the general practice was to lag the still; this procedure reducing the steam consumption. When the still was unlagged, the amount of waste liquor was nearly twice the quantity of crude liquor passing into the still; while when the plant was lagged, the waste liquor was only 1·3 times as great as the crude. He asked whether the author added any tar to the sulphuric acid before it was used in the saturator. He had recently carried out a series of experiments which showed that a theoretically satisfactory manner of dealing with the effluent was to pass it through clinker saturated with water containing manures. Unfortunately, it was only a theoretical solution of the difficulty, for in practice 1 cub. yard of the saturated clinker was required for 3 gallons of effluent.

Mr. J. K. Grant (South Suburban) reminded members of the method of dealing with effluent which they had seen during their recent visit to the works of the Hornsey Gas Company.

Mr. E. F. Stevens (South Suburban) remarked that the author had stated that the least moisture figure it was practicable to obtain in the salt leaving the works was about 0·2 p.ct.; but he (the speaker) knew of one large company able to reduce the moisture content below this figure, and to manufacture salt which was absolutely neutral and which exhibited no tendency to cake. Mr. Walker had suggested that, in order to prevent caking, it was desirable to have a small amount of free acid present in the salt. Was it not true to say that absolutely dry and neutral salt would have no tendency to cake? Did such a salt absorb moisture?

Mr. D. Cleave Cross (Lea Bridge) said he had had no direct experience of sulphate making for the last three years. At Lea Bridge, as soon as the waste water left the works, it came into contact with the sewage from the adjacent town; and this caused trouble. They had tried every form of treating the effluent to make it acceptable to the Lea Conservancy. Though the effluent was all right when it left the works, immediately it came in contact with the sewage, it turned black. Even the Hornsey method had proved no solution to their difficulty.

Mr. J. H. Goldsmith (Hon. Secretary) expressed his regret that the author had given no information on the semi-direct process of sulphate manufacture, which seemed to be gaining ground. The tests which Mr. Walker had put forward regarding the caking of sulphate were most instructive. Theoretically, the presence of free acid should encourage caking, but, judging from the author's tests, when the amount of free acid was greater, the caking was less. Mr. Goldsmith suggested that perhaps it was not fair to compare the caking properties of three salts, one of which was un-neutralized and had been dried by natural drainage, another which was un-neutralized and had been dried by whizzing, and a third which was a neutral salt. He thought that natural draining would tend to give a larger crystal which would not cake as readily as the finer crystals resulting from whizzing. Regarding the method of scrubbing the waste gases with acid, had the author found that the small scrubber set-up an excessive amount of back-pressure?

Mr. Walker said that, though he had no personal experience of the acid scrubber, he did not suppose it would be responsible for any undue back-pressure, provided the seal was properly adjusted. Mr. Prater had mentioned that the quantity of spent liquor could be greatly reduced by lagging the stills; and this was an important point, for one of the ways of minimizing the trouble from effluent was to cut-down the amount as far as possible. He had not considered the treatment of effluent in his paper. This question, he thought, should be treated as a separate subject. He had no experience of adding tar to the acid. Mr. Stevens had queried the figure for moisture content. It was, of course, possible to reduce this to 0·1 p.ct. by steam drying; but after storage, especially if the crystals were not well defined, the salt would probably pick-up moisture. He thought that 0·2 p.ct. was a reasonable figure for the moisture content of the salt as it left the works. Dry salt was hydroscopic; and the smaller the crystals, the greater the tendency to absorb moisture. It was, of course, not necessary to have a small quantity of free acid in order to prevent caking. Theoretically, it was detrimental; but he thought the figures which he had given were interesting as being the results of actual tests. It was his experience that sulphate did not cake readily when it contained a small amount of free acid, and if it did cake, then it was easily broken up. The case at Lea Bridge was interesting. He could only conclude that the trouble was due to the chemical treatment of the sewage. He had not dealt with the semi-direct method of sulphate manufacture. In a short paper it was impossible to consider anything more than a definite and small section of a wide subject. To a certain extent he agreed with Mr. Goldsmith's remarks about the figures which he had given for the caking of the three salts. Possibly the acid salt would not cake as quickly owing to the greater percentage of moisture which it contained, which would take a longer time to dry out. Though the crystals of salt dried by natural drainage might appear coarser than those resulting from centrifuging, he did not think that they were actually any larger.

A vote of thanks to the authors of the papers was proposed by Mr. Prater and seconded by Mr. C. I. Winstone, of the Gas Light and Coke Company. Mr. Prater mentioned that the reason for adding tar to the acid was to coagulate the arsenic trisulphide and pentasulphide. There was no difficulty in skimming-off the tar.

Farm Notes.—We have received No. 6 issue of the British Sulphate of Ammonia Federation's publication, " Farm Notes on Profitable Farming." This publication is issued several times a year, and the Federation distribute 25,000 copies of each number free to farmers, merchants, and others interested in agriculture.

Faraday Society.—A general discussion on the subject of explosive reactions in gaseous media has been organized by the Faraday Society to take place on Thursday, May 13, at the Institution of Mechanical Engineers, Westminster, S.W.1. The proceedings will be divided into two sessions. The first, from 2.30 to 6.30, will deal with the subject generally, and Prof. H. B. Dixon, F.R.S., will preside. An introductory survey will be given by Dr. W. E. Garner, and papers initiating discussion will be presented by Prof. Dixon, Prof. W. T. David, Dr. S. W. Saunders, Dr. R. V. Wheeler, Prof. W. A. Bone, and Dr. C. Campbell. The second session, 7.45 to 10, will deal with explosive reactions considered in reference to internal combustion engines. Sir Dugald Clerk, F.R.S., will preside, and he will give an introductory survey, being followed by Prof. David and Mr. H. T. Tizard. A dinner will be served between the sessions at the St. Ermin's Hotel.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

[In a paper at this meeting, Mr. A. M'G. Clark explains the new distribution system of the Perth gas undertaking. Details are given of the erection of a gasholder at Friarton.]

The Annual General Meeting of the Association was held in Edinburgh on Saturday, April 17—Mr. A. McG. CLARK (President) in the chair.

The HON. SECRETARY AND TREASURER (Mr. J. Scobie, Dunfermline) detailed the annual report of the Council for the 22nd session, and also the financial statement. The report included the following items:

The Council regret that the Vice-President, Mr. H. A. Yuill (Dundee), has now left the profession, and wish him success in his new sphere. To fill this vacancy, Mr. M. Darling (Cowdenbeath) was elected; and the Council are confident that this appointment will meet with the approval of the members.

The sincere thanks of the Association are due to Mr. James Campbell (Dunfermline) and Mr. Alan Reid (Brechin), honorary members, for their generosity in providing prizes for the best papers given by members during the session. Only two papers were received; but the Council hope by next session to see the competition growing.

Congratulations are extended to Mr. A. C. Young (Tayport), on his appointment to Bridge-of-Allan; to Mr. A. W. Farquhar (Edinburgh), on his appointment as Junior Technical Assistant at Leven; to Mr. G. Lawrie, on his appointment as Engineer and Manager to the Dunoon Corporation; and to Mr. J. W. Evans, on his appointment as Distribution Foreman at Kennoway.

The Association are indebted to Mr. H. H. Gracie (Edinburgh) for his gift of bound volumes of the "Gas World" (1901-1915). Also to Mr. E. L. Farquhar (Lower Largo) for a complete set of the "Transactions" of the Association.

The Council have had under consideration the Education Scheme of the Institution of Gas Engineers. Owing to the gravity of the position, it was deemed necessary to forward resolutions to the Advisory Committee regarding the position of our members, who are mostly "external students;" the provisions under section 2 of the scheme being such that an extremely small number would be in a position to qualify for entrance to these examinations. The Council tender their thanks to the Council of the Western District, and also to the English Junior Associations, for their support. An arrangement has been made by which classes will be held in various districts to suit intending candidates; and the Council trust that members who are in doubt regarding their eligibility, or cannot obtain tuition, will at once communicate with the Hon. Secretary and Treasurer.

The accounts showed a credit balance at April 5 of £34 15s. 6d.

The PRESIDENT then remarked on the large amount of work which the Council had had during the session, and expressed his regret that the Hon. Secretary and Treasurer had found it necessary to resign his position.

The HON. SECRETARY AND TREASURER, in tendering his resignation, expressed his regret at being unable to stand for re-election, owing to his not having sufficient time to devote to the affairs of the Association.

The PRESIDENT reported that the Council had that day suggested that Mr. J. Dickson (Dundee) and Mr. H. Gourlay (Markinch) be elected Honorary Members; this announcement being greeted with applause.

The following office-bearers were thereafter elected for the ensuing session:

President.—Mr. M. Darling (Cowdenbeath). *Vice-President.*—Mr. E. L. Farquhar (Lower Largo). *Hon. Secretary and Treasurer.*—Mr. D. Yule (Edinburgh). *Council.*—Messrs. J. Scobie (Dunfermline), J. Ford (Prestonpans), W. S. Johnstone (Dundee), and J. W. Evans (Kennoway).

The last-named is in place of Mr. D. Garvie (Tradeston), who has resigned.

PRESIDENTIAL ADDRESS

of ALAN M'G. CLARK, of Perth.

[Extracted.]

EDUCATION SCHEME.

After due consideration of the scheme and its obvious impracticability so far as the Eastern District of Scotland was concerned, we formed a number of resolutions, which in a nutshell stated that, owing to an obvious lack of approved schools, there should be more elasticity; in other words, where it was impossible for our students to attend an approved school, then these students should be allowed to obtain their knowledge where and when they liked, so long as they attained the necessary standard. Joint Council meetings were held, also meetings with the Advisory Committee; and through the good offices of Mr. Fulton, Principal Laurie, Dr. Gray, and other members of the Advisory Committee for Scotland, we are promised that something will be done to suit our conditions—the opening-up of more schools of the required standard, with the possibility of having external students of the approved schools under the Board of Education, or in extreme cases the employment of tutors or other outside sources of education.

In anticipation of your visit to Perth next month, I thought that an address based on our new supply scheme, which I hope you will see in operation, would be appropriate.

PERTH'S GAS SUPPLY.

The first company for the supply of gas to the City of Perth was formed in 1824. In 1844 a rival company came on the scene, and erected works near the Fair Maid's House on ground now part of Messrs. Pullars' dyeworks. Serious competition followed between the two companies, with results not beneficial to either; and it was not surprising that in 1868 the two companies amalgamated. The manufacturing power of the older company was then about 29 million c.ft. per annum, and of the new company 11 millions. In 1871 the works were transferred to the Local Authority.

In or about 1888, the works seemed to be expanding greatly, as a two-lift column-guided holder of 550,000 c.ft. capacity was erected at the Shore, over half-a-mile from the works. Another of similar capacity but of greatly different type—namely, a Gadd & Mason rope-guided holder—was erected alongside the other in 1896-97. At this time another great step was taken by erecting a governor house in the vicinity of these two holders, with separate governors for the city, Scone, and Craigie districts. A few years after, the works in Scott Street had run their course or were totally inadequate for the demand, though judging from their situation near the centre of the town, the lack of railway facilities for coal and coke transport would be one of the chief difficulties, and the want of room for expansion another. Complete new works costing £58,000 were opened at Friarton, nearly two miles from the city, in 1901. At that time the output of gas was 181 million c.ft. Since 1901 the works have undergone the usual evolution which has been the lot of most large and medium gas-works. In 1923 the horizontal carbonizing plant was superseded by the Glover-West system of vertical retorts.

The output of gas has risen from 180 million c.ft. in 1901 (when these works were opened) to 360 million c.ft. at the present day. A storage capacity of 1 million c.ft. (only half of which allows for sufficient pressure for the town supply, owing to the lightness of the upper lift of both holders) is therefore totally inadequate, and offers no margin for economical working or for carrying out repairs.

NEW DISTRIBUTION SCHEME.

When the Government launched their unemployment relief schemes, the Perth Town Council promptly took advantage of their conditions to erect a gasholder, and incidentally to carry out a new scheme of distribution. The policy formulated was really this: That the locus of the distribution system, both low pressure and high pressure (we boost gas west to Methven, 7 miles, to the intermediate villages, and also to Bridge of Earn to the south, 4 miles), should be transferred to the manufacturing station at Friarton, hereinafter called No. 2 Centre, but still keeping the gasholders and governors and boosters at the Shore (hereinafter called No. 1 Centre) intact as a distribution centre ready to put into operation if necessary. The two gasholders in this case would be supplied from the heavier No. 3 holder, now constructed at No. 2 Centre, but they would normally be filled with gas in reserve. This state of affairs would last until the holders at No. 1 Centre had run their course, when this centre would be entirely dismantled and No. 2 Centre would be the sole source of distribution.

The scheme called for the following:

(1) Erection of a new gasholder, complete with inlet and outlet mains, at the works (No. 2 Centre).
(2) By-passing the holders at No. 1 Centre.
(3) Laying of a 6-in. high-pressure steel main to No. 1 Centre, and the laying of a 4-in. high-pressure steel main to a point on the Bridge of Earn route.
(4) Erection of a governor and booster house, complete with station governor, duplicate boosters with governors.

The scheme has taken nearly sixteen months to complete; and though I have been engaged on most schemes appertaining to gas-works, this one, for covering a wide range of technical work, takes first place.

GASHOLDER FOUNDATIONS.

It is an axiom that foundations must be kept dry; but how often this is difficult to carry out! We made several borings over the site by the simple method of driving-down a 1-in. M.I. pipe, and noting the various strata of soil and their state of humidity at each foot of depth, until the depth of 6 ft. was reached, when the human element failed, owing to the tremendous suction. A trial pit 9 ft. square by 9 ft. deep was dug near the river bank on the centre line of the holder; but this only confirmed our borings. At this stage the subsoil was moist but firm; and we came to the conclusion that it would not be overloaded at 1 ton per sq.ft., which at that time was the estimated weight of the proposed holder. The ground on which the holder is built is really river drift, as the original river bed—namely, the boulder clay stratum—is clearly defined, and shows how the river has gradually receded.

You will probably ask why the foundations were not carried down to the hard strata. When all things were taken into consideration—the proximity of the river, the danger of flooding due to the abnormal spates, and the great cost of excavation under these conditions—we decided to give the foundations

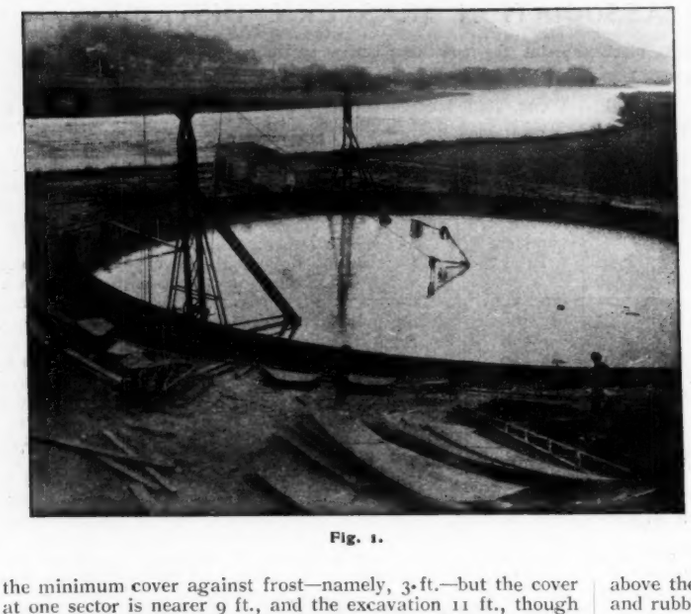


Fig. 1.

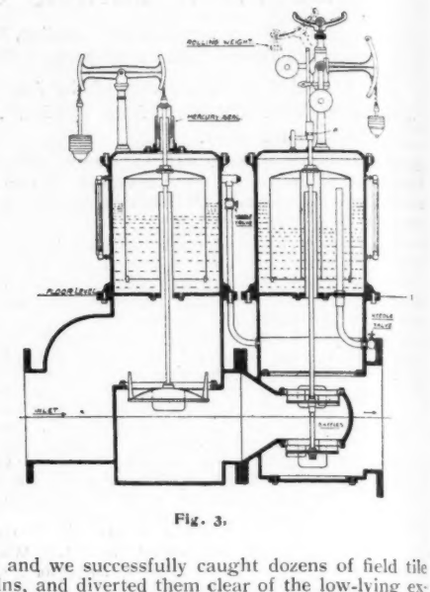


Fig. 3.

the minimum cover against frost—namely, 3·ft.—but the cover at one sector is nearer 9 ft., and the excavation 11 ft., though the holder is specified as "with steel tank above ground." The question of reinforcing the concrete was considered; but from the data we obtained as to the ground being uniformly soft and silty, we decided to use ordinary concrete 2 ft. in thickness as a minimum. Why? Though a great believer in reinforced concrete work, in this case I hold that the conditions calling for reinforcement did not exist. The whole area was soft, and as the load was equally distributed, we could see that nothing was to be gained by reinforcing. The following table, which is the result of my experiences, may be of interest.

(1) Hard ground (uniform).	Ordinary concrete.
(2) Hard and soft ground (variable).	Reinforced concrete.
(3) Fairly soft over the whole area.	Ordinary concrete.
(4) Fairly soft and water-logged or running sand.	Ordinary concrete and sheet piling.
(5) Extremely soft over whole area.	Concrete piling and reinforced raft.

Before the last method is adopted, it may be advisable to look out for another site, as the cost of piling over such a great area is very great. The above applies to uniformly distributed loads such as gasholders, but each case must be judged on its merits.

The method we adopted was No. 4. The weight of the tank, holder, and foundations came out to 14,000 tons, approximating to 1 ton per sq.ft. over the area of the foundation, which was 134 ft. in diameter. Catch drains were laid on the high land above the site; and we successfully caught dozens of field tile and rubble drains, and diverted them clear of the low-lying excavations. The excavations were carried out under appalling weather conditions; the River Tay being on its worst behaviour during this period. It was reckoned that nearly 40,000 gals. of water were pumped out of the workings daily during the excavations, which took nine weeks to accomplish. When we reached a depth of 5 ft., the nature of the ground became interesting. On draining water from a portion of the ground, pure slurry was left; but when this was dredged away, fairly solid blue sandy clay was exposed. After a few minutes this became wet, and in an hour's time was converted into slurry—in other words, the soil exuded its moisture on exposure to the atmosphere. This happened down to the extreme depth, and caused endless trouble. This state of affairs occurred irrespective of the height of the river.

The concrete was composed of whin metal, sand, and cement in the proportion of 4-2-1, and was laid over the whole area (previously bottomed with quarry rubble) in four layers, 9-in., 8-in., 6-in., and 4-in. thick, the last being the finishing coat, giving a perfectly level peripheral track and a 6-in. rise to the centre. Each day's concreting was plotted on a plan, to ensure that subsequent layers would "break band." The first was laid when and where possible, owing to the difficulty of removing the sludge. The concrete was mixed by Winget's mixing machines, and the total quantity (1100 cub.yds.) laid in about two months—a good performance considering the wintry

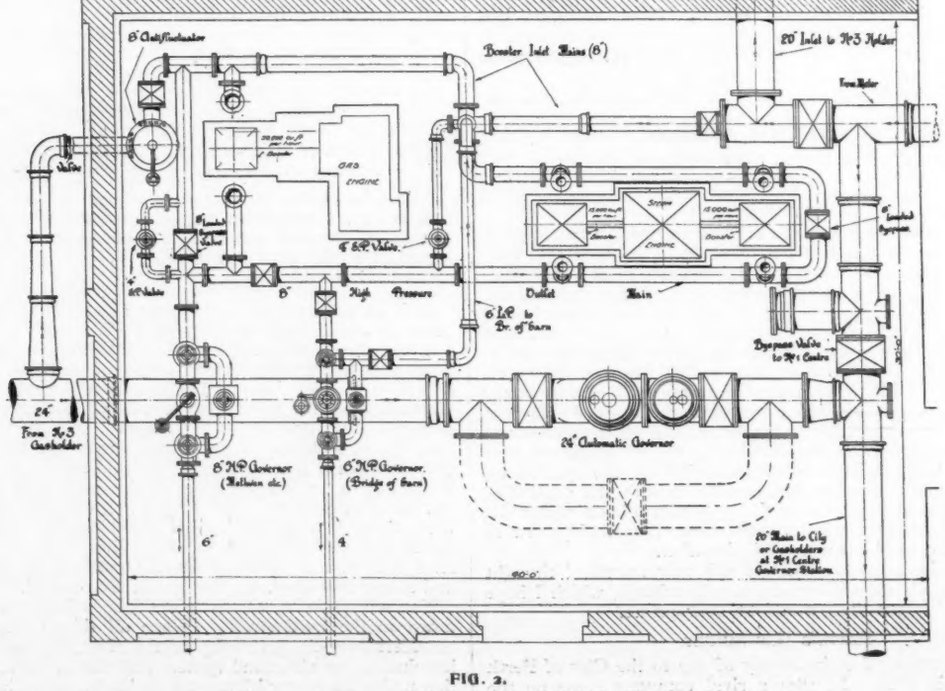


FIG. 2.

conditions. We discarded the usual aggregate measuring methods, and adopted the system of throwing the required number of heaped shovelfuls in certain order into the mixer. Well-mixed concrete was turned out at the rate of 4 cub.yds. per hour, by four men. A clerk of works by this method has to see that the proper time is allowed for complete mixture, and that an extra shovelful of aggregate is not thrown in occasionally. All empty cement sacks were counted after each day's concreting, and this, compared with the concrete laid, formed a good check, by simple calculation, whether the quality was being maintained. Our specification stipulated that the cement should withstand a tensile stress of not less than 400 lbs. per sq.in. after immersion in water for seven days; and I tested each delivery with the Michaelis cement-testing apparatus, the minimum result being 410 lbs. per sq. in.

The sheet piling consisted of good railway sleepers, pointed in such a way as to keep each pile hard up to the preceding one during driving. This system of piling is primitive and cheap, compared with the more modern tongued and grooved wooden or reinforced concrete sheet piling. The piles were all driven into the hard strata.

Gasholder.

The contract for the gasholder was placed with Messrs. R. & J. Dempster, Ltd., of Manchester, and it is a replica of the one recently erected at Dunfermline. It is of the spiral-guided type, with four lifts and steel tank having a capacity of 1¼ million c.ft.; the minimum pressure thrown being 6¾ in., and the maximum 13¼ in. It is fitted with "Bearscot" carriages throughout; those on the grips being twin-yoke with linked rollers, and those on the tank the single-yoke quadruple-roller type. All are fitted with self-acting lubricators, while the latest improvements, such as run-down stops and water run-offs from the crown and dips to tank, are incorporated in the design, and anti-freezers are fitted to the tank and lifts. Our calculation for the thickness of tank plates was run out from the formula:

$$\frac{W \times D \times R \times E \times S}{144 \times F \text{ (in lbs.)}}$$

where W = wt. of 1 c.ft. of water.
D = depth of tank in feet.
R = radius of tank in inches.
F = tensile strength of steel = 28 tons per sq. in.
S = factor of safety = 4.
E = efficiency of riveted joints = 75 p.ct.

The lower tier of plates was made 13/16 in. thick, and the upper tier ⅜ in., the intermediate rows varying proportionately to the bursting pressure. The tank is 132 ft. 1½ in. in diameter by 27 ft. 8 in. deep.

The work was started on May 1, 1925, and was nominally completed ready for testing at Christmas. One or two points regarding construction may be of interest. The tank bottom, consisting of ¼-in. plate, was riveted up on wooden props 2 ft. 3 in. high, placed at intervals on the concrete, the first tier of side plates being riveted on also at this stage. The bottom was then tested with water (9 in. deep), and found to be tight. (See fig. 1.) While the water was being run off, the concrete was covered with 1 in. of sand, to protect the rivet heads, while the underside of the tank bottom was painted with hot pitch. The lowering was accomplished by withdrawing the innermost circle of props, and gradually working towards the outer edge. To an outsider this looked a dangerous proceeding, but after a ring or two of props were withdrawn, the bottom sagged until it rested on the concrete, which you will remember was 6 in. higher in the centre than at the periphery; and the bottom curb, now carrying one tier of side plates, was lowered by jacking-up, and removing successive layers of wood packing.

In the erecting of the gasholder proper, a somewhat new method was adopted. Instead of building-up the inner and third lift from the bottom, and second and fourth lifts in the air (so to speak), and lowering, all lifts were erected from the rest blocks in the sequence 4-3-2-1, more or less simultaneously. Though this method probably costs more, this is offset by the finished appearance of the holder. It is obvious that as the lifts are built from a level foundation, there is less chance of distortion as compared with the other method. Messrs. Dempster are to be complimented on their workmanship.

The River Tay now made amends for its previous cantrips, and proved an admirable reservoir from which to pump the necessary 2¾ million gals. to fill the tank. This was carried out by the local fire brigade.

The following table shows the painting scheme as required by our specification, as this is always a source of discussion:

Internal Work:	
Tank and bottom	2 coats "Bitumastic" (black).
Lifts, crown, and crown framing.	1 coat "Viternus."
Grips and lutes	1 coat "Humidine."
External Work:	
Tank	2 coats grey "Bitumastic."
Lifts	2 coats grey (graphite).
Crown	2 coats white (do.).

Inlet and Outlet Mains.

According to the dual purposes of the new holder—*i.e.*, distribution or relief, it was necessary to allow for either of these purposes in the arrangement of the inlet and outlet mains for the gasholder. On the existing outlet main from the station meter, just outside the meter house, had been placed a small Livesey washer, used originally for naphthalene extraction, but now no longer required; and this formed the key to our scheme. The inlet and outlet mains of the washer were to fulfil the same functions for the holder, while the by-pass for the washer was to be utilized as such when it was necessary to by-pass the new holder while working on No. 1 Centre holders, or in using the former as a relief holder only. Fig. 2 shows this part of the scheme, which, however, differs slightly from these original proposals. The Livesey washer was removed, and the scheme commenced. The inlet main to the holder is 20-in. diameter, and the outlet main 24-in. diameter; the total lengths of each being about 170 yds. This section of the work had to be accurately surveyed and levelled; the difference in level of the gasholder valves and the station meter outlet main being 17 ft. The mains were laid alongside the boundary wall (on the river side), then under the foundations of same, to rise up steeply to the required level of the existing main. During the progress of this work, accurate levelling and measurements were the great factors, as owing to certain circumstances we had to start 10 yds. away from the holder valves, and finish within a few yards of the new 24-in. governor, which was not yet on the site.

Station Governor.

Instead of governing each of the three districts, Perth, Scone, and Craigie, as is done from No. 1 Centre, we decided, after carefully compiling data from each locus, that one governor at the new centre would serve the purpose of all three. A study of this question would form the subject of a whole paper, as also would the description and working of the new type of governor we adopted. This was a 24-in. automatic self-loading station gas governor (Simpson's and Peebles' patents). It consists essentially of two units—(1) a differential governor dealing with changes of inlet pressure, due to cupping or uncupping of the holder, and throwing a constant differential pressure across the valves of the self-loading governor irrespective of the pressure or consumption; (2) a self-loading governor which throws a pressure proportional to the valve displacement. The principle employed to secure variation in pressure is that of the variable movement of a rolling weight moving in a definite direction through a curve acting in relation to the stroke of the valve. Fig. 3 shows the arrangement of the governor.

Mr. M. Darling congratulated Mr. Clark on his address, and proposed a vote of thanks, which was heartily responded to.

The members were then joined by their lady friends at tea, after which there was an enjoyable whist drive.

Carburite.

In a paper recently read before the South Wales Institute of Engineers, Mr. David Brownlie, B.Sc., referred to a new process due to Dr. Rudolf Delkeskamp, of Berlin, in which it is claimed that coal or any other carbonaceous material can be briquetted without any binder, merely using the ordinary simple type of briquette press at 1 to 2 tons per sq. in., instead of abnormally high pressures. The principle is novel, and uses as a binder merely part of the coal itself, which is ground-up with water to a colloidal condition, and then mixed with the bulk of the coal. The resulting briquettes are carbonized direct without expansion or other troubles, either at low temperature to give a smokeless free-burning fuel known as "Carburite," or at high temperatures to give "Carburite Coke," which is claimed to be much superior to ordinary coke. Any carbonaceous materials can be used as the colloidal binder. Bituminous, semi-bituminous, and anthracite coal, canneloid refuse, brown coal, lignites, and peat all can be converted into hard briquettes by mixing them with any carbonaceous material, blended or otherwise, in a colloidal condition. The process turns on what is the cost of grinding and how much of the fuel in the colloidal condition is required. It is believed that anything from 6 to 20 p.ct. of the material has to be colloidalized.

Fruit and Health.—The current issue (No. 145) of "A Thousand-and-One Uses for Gas" brings to light the news that we in this country eat nearly 1500 million bananas a year. It gives a description of the scientific and hygienic manner in which the bananas are ripened on arrival. There are already in use in this country some 3500 banana ripening rooms, the white-painted interiors of which are kept spotlessly clean and heated by gas burners fitted with special apparatus which automatically ensures at all times just the amount of heat which will in a few days thoroughly ripen the bananas and convert them into a wholesome, digestible and attractive fruit-food.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Fourth Annual Meeting of the Association was held at the Gas Offices, Newport, on April 17.

Mr. J. Wood (Pentre), President of the Association, said they were all delighted to meet again at Newport, and to be favoured by the presence of Sir A. Garrod Thomas, M.D., D.L., a Director of the Newport (Mon.) Gas Company, and by that of Mr. J. H. Canning, O.B.E., the Engineer and Manager of the Company.

Sir Garrod Thomas welcomed the Association.

Mr. Canning supported the welcome, and proceeded to refer to the Electricity Bill. In that morning's "Western Mail" was a striking statement by the Chairman of the South Wales Power Company, who said that in his opinion it would be many years before any cheapening effect would be produced. He was, indeed, doubtful whether at any time there would be any lowering of the price of electricity. They might, said Mr. Canning, regard the measure calmly, and with absolute confidence that there was no reason for alarm. In 1877 Edison introduced his new electric lamp, which caused such alarm that the price of gas stock fell heavily. They had heard something within the past few weeks of the effect of the Government's electricity proposals upon gas stock, but this had been microscopic compared with what occurred in 1877. Thousands of investors were then misguided enough to sell out their holdings in gas undertakings; and it must have been mortifying to them to find that within a short time gas shares had resumed their former high quotations. The following extract from the "Journal of Gas Lighting" for Oct. 22, 1878, would enable them to understand the feeling then prevailing.

THE PUBLIC AND THE GAS COMPANIES.

Public (exultingly)—

You're bothered and worried,
And fearfully flurried,
Respecting electric light,
When eating or drinking,
You cease not from thinking
Is Edison really right?

Gas Company (calmly)—

Whatever's the matter,
Why make such a clatter?
We're not so easy alarmed.
We laugh at decaying,
And think of the saying,
"Forewarned is to be forearmed!"

In 1877 the public were dealing with something then unknown, whereas in the present instance, and as a result of experience of both agents, the public generally had full confidence in the future of gas. One of the results of the former scare was to stimulate the gas industry to meet the new conditions; and consequently companies began, in a small way, the modern policy of cultivating the consumer. The introduction of the Siemens regenerative furnace immediately followed, together with other improvements in gas apparatus, including the Welsbach incandescent burner. If they were wise, they would take a lesson from the past. There were still numerous directions in which service to the public could be improved, ensuring a more efficient and cheaper supply of gas, and thus securing their hold upon the great body of consumers throughout the country. Providing this were done, he thought they need have no undue fear of electrical competition. The gas industry was well able to hold its own; and he saw no reason why both gas and electric interests should not flourish side by side.

Mr. B. J. Bell (Cardiff) moved a hearty vote of thanks to Sir Garrod Thomas and Mr. Canning for their presence and support, and to the Chairman and Directors of the Newport (Mon.) Gas Company for the hospitality so readily extended to the Association at all times.

Mr. C. Bateman (Bath), seconding the vote, stated that the South Wales Power Company, which had been mentioned by Mr. Canning, had an area of about 1100 square miles. Notwithstanding their huge area, however, that Company up to the present had paid no dividends.

The Treasurer (Mr. A. H. Shepherd, Swansea) presented the statement of accounts, showing a balance in hand of £25 1s. 3d.

Mr. T. A. Canning (Dewsbury) proposed that the accounts, as presented, be accepted, and an expression of their thanks accorded to Mr. Shepherd, their Treasurer, and Messrs. T. Noall and R. W. Foster, their Auditors.

Mr. C. B. Felton (Newport) seconded the motion, which was carried.

The Secretary, Mr. W. E. Crowley, submitted the Report of Council, from which the following extracts have been made.

Report of Council.

In reviewing our work, first place should be given to an expression of our appreciation of the encouragement afforded to us by the Wales and Monmouthshire District Institution of Gas Engineers and Managers, particularly for the gifts of books made to our members in recognition of examination passes and for papers delivered to our Association.

Mention, too, must be made of the honour conferred upon our members, Mr. C. Bateman, of Bath, Senior Vice-President, and Mr. T. V. Blake, of Cardiff, member of Council, who were awarded Diplomas by the Institution of Gas Engineers.

Mr. J. Wood has rendered sterling service in the interests of the Association; and your Council wish to express their high appreciation of the work he has so well carried out.

Messrs. C. B. Felton (Newport) and T. V. Blake (Cardiff) retire from the Council at the close of the present session. Mr. Felton has served on the Council for three years, and Mr. Blake for one year, being elected in 1925 to fill a vacancy.

Mr. D. M. John (Aberdare) has resigned the office of Senior Vice-President, and, as you are aware, Mr. C. Bateman has been elected to that office.

Fifteen new members (7 ordinary and 8 associate) have been enrolled during the session.

Mr. R. P. Jones (Cardiff) proposing that the report be adopted, paid a warm tribute to the Council and Officers for the able way in which the work of the Association had been carried out.

Mr. J. H. Plaisted (Newport) seconded.

The Secretary submitted the recommendation of the Council for the following amendment of the rules:

Library.—The Council may employ any part of the funds of the Association in the provision and maintenance of a suitable collection of books, reports, statistics, accounts, papers, maps, instruments, materials, and other things of interest to the industry. The Council may in special cases contribute from the funds of the Association towards the provision or maintenance of branch libraries.

The Council may from time to time make, revoke, and alter rules relating to all matters connected with the library.

On the motion of Mr. T. Smith (Cardiff), seconded by Mr. H. J. Victory (Newport), it was resolved that the rules be amended as recommended by the Council.

Officers for the 1926-27 Session.

President	Mr. C. Bateman, Bath.
Senior Vice-President	Mr. T. V. Blake, Cardiff.
Junior " "	Mr. C. B. Felton, Newport.
Hon. Secretary	Mr. A. E. Martin, Merthyr.
" *Treasurer*	Mr. A. H. Shepherd, Swansea.
" *Librarian*	Mr. F. H. Osborne, Cardiff.
" *Auditors*	Mr. T. Noall, Cardiff. Mr. R. W. Foster, Cardiff.
Council	Mr. W. E. Crowley, Newport. Mr. R. J. Williams, Abertillery.

On the proposition of Mr. Shepherd, a vote of thanks was accorded to Mr. W. E. Crowley, who was not seeking re-election as Secretary, for his services. Mr. Plaisted seconded the vote, which was carried with acclamation.

Welded Steel Sleeves for Cracked Mains.

Attention has been drawn by the "American Gas Association Monthly" to a "wrinkle" in the repairing of cracked cast-iron mains, which was tried-out by the Portland Gas and Coke Company, of Oregon. In order to overcome objections to the previously-used cast-iron split sleeve, a successful experiment was made with a welded steel sleeve. This sleeve was simply a steel cylinder slightly larger than the pipe, and made in two parts. The two parts were fitted round the pipe, and electrically welded in place; the open ends being caulked with lead, in a similar manner to the procedure with the cast-iron sleeve. The leak was stopped temporarily by means of soap and leakage tape while the work was being carried out. The entire operation was completed in a few hours; and if it had been an emergency, the time could have been still further shortened. The steel sleeve was made from ordinary plate; and a similar one can be made up at any time without the necessity for carrying special material in stock. Welding of the two halves eliminated all chance of leakage at the point where the greatest trouble was experienced with the cast-iron sleeve. The use of the steel sleeve was so satisfactory that cracks of the same kind in cast-iron mains will in future be handled in this way.

Manchester District Institution of Gas Engineers.—Arrangements have been made for the next quarterly meeting of the Institution to be held at Hull on Wednesday, May 12, when there will be luncheon at the City Hotel, by invitation of the Chairman and Directors of Messrs. G. & T. Earle (1925), Ltd., whose chalk quarries, clay fields, and Humber Works will afterwards be inspected. The train by which the party will travel leaves Victoria Station, Manchester, at 10.8 a.m.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Meter Prices.

Sir,—The outspoken letter of Dougall's Gas Meters, Ltd., to the gas undertakings of the country, dated Feb. 11, 1926, and advertised in your issue of Feb. 17, and the explanatory communication of Parkinson & Cowan (Gas Meters), Ltd., of March 9, published in your issue of March 17, offer, in themselves, sufficient food for thought by all in positions of responsibility for the conduct of the gas supply service of this country; but when it is fully realized that these are merely the outcome and confirmation of the fratricidal strife reigning throughout the meter trade during the last year-and-a-half with its inevitable uneconomic results and financial loss, is it not time the gas-supply industry took stock of the situation, and made serious inquiry as to whither all this is leading, and the ultimate effect it must have upon the life and dependence of that arbitrary instrument which stands between the industry and its multitudinous customers. As you yourself remark in your editorial of March 17:

> Now it is obvious to all intelligent business men that the cutting of prices cannot continue to unremunerative levels without quality ultimately suffering, which, in a mechanical measuring instrument such as a gas meter, subject to modern gas-supply conditions, is something which must not happen. If it does, cheapness will be expensively paid for in maintenance and renewal, and through the item of unaccounted-for gas.

I think there will be little, if any, disagreement with your opinion thus stated. The immediate question, therefore, is: What is the remedy, and how soon can it be applied, and the threatened damage arrested? The scheme outlined in Messrs. Parkinson & Cowan's communication may, or may not, be the essential solution; but in most favourable circumstances, this, or any other sliding-scale, profit-sharing, bonus, discount, or rebate scheme, would take considerable time to arrange and agree. Meantime, the damage to the gas industry is a cumulative quantity. The scheme put forward by Messrs. Parkinson & Cowan is evidently not acceptable to all meter makers; and it is problematical as to whether it is likely to meet with universal approval among gas undertakings. Further, the meter makers of themselves are seemingly unable to arrive at any other presently acceptable solution of the difficulty. Cannot, therefore, the gas industry "lend a hand" at this stage, and assist in bridging the chasm? In the past we have not hesitated to call the makers of meters and other appliances into conferences, when prices have been considered too high. What, then, is to prevent another conference of buyers' and sellers' representatives to discuss the situation and determine upon some remedy, now that prices are indubitably too low, and injury to the gas industry involved thereby? The action of Dougall's Gas Meters, Ltd., is courageous; but individual action of this kind merely "scratches the surface;" and unless quickly followed by others, has no material effect upon the situation. But some such action, concerted by all interested, would appear to promise the most speedy temporary relief.

As the matter seems to have reached a deadlock, and the resultant damage likely to be intensified as resources are further strained by the continuation of this cut-throat policy, I respectfully suggest that the time is ripe for a move on the part of one or other of the organizations of the gas industry with a view to:

(1) Determining, in conjunction with the makers, what is a reasonable addition in price to be made under present-day costs of production to lift the meter industry out of the slough in which it is now wallowing, and ensure the life, efficiency, and accuracy of its products at the standard necessary to meet the exacting requirements of the present.

(2) Considering the practicability of any proposals put forward to secure the avoidance of a recurrence of the present dilemma, and that of the other extreme, in the future; and promoting confidence among all parties concerned.

The organizations of the gas industry are amply equipped and constituted for rendering such assistance; and, given a willingness on the part of the meter makers, it might quickly be put into operation. The Society of British Gas Industries has its Meter Section; the British Commercial Gas Association is an organization of which the "S.B.G.I." is a constituent part; and the National Gas Council is qualified to work in conjunction with, and form any Committee with, such interests as intimately affect the gas-supply industry. Indeed, in 1919, a Standing Joint Advisory Committee was formed, consisting of an equal number of members from the National Gas Council and the "S.B.G.I.," for the consideration of matters of mutual interest.

The question of initiative naturally arises; and I submit that the gas supply industry has every justification in taking the initiative in this case (the makers having failed to find a solution), either by an approach to the Meter Section of the "S.B.G.I.," or to the meter makers generally, or through any other suitable channel. This approach might be made by the "B.C.G.A.," which comprises meter makers' representatives, via the "S.B.G.I.," or, perhaps preferably, by the rather more independent National Gas Council, through the aforementioned (or similar) Standing Joint Advisory Committee, which Advisory Committee, in other circumstances, set-up a Joint Meters Committee in 1919 to consider prices, &c.

As the essence of my suggestion is goodwill, and an all-round desire to remedy the present deplorable state of affairs, I have ventured to submit my views in this manner, that they may be given the widest consideration, and possibly meet with a response in your "Correspondence" columns sufficient to indicate, from makers and users of meters alike, the advisability of proceeding, without unnecessary delay, upon some such lines as I here propose.

R. G. Shadbolt.

75, Trafalgar Road,
Moseley,
Birmingham,
April 23, 1926.

Slot Meters and Hire Purchase.

Sir,—With reference to your editorial on the above question in the current issue of the "Journal," it will probably be interesting to you to know that we have for some time past encouraged consumers in this area to purchase cookers and fires on hire purchase terms by the method you mention, and it has met with a considerable amount of success. The meters have been set in excess of the normal price of gas, and are emptied monthly. The balance over the sum required to pay for the gas consumed is handed to consumers, who then pay back to the collectors the amount of rent due for the appliances under purchase.

This system has enabled consumers who would otherwise have found it inconvenient to pay by the usual quarterly method to purchase appliances, to the mutual benefit of consumers and Department alike, without feeling any monetary loss on the transaction. I consider, in an industrial town such as Smethwick, with an artisan population, this is an excellent method of promoting the sales of gas appliances.

Ernest Hardiker,
Engineer and Manager.

Gas-Works, Smethwick.
April 22, 1926.

Wrought Iron and Steel Tubes.

Sir,—In reply to Mr. Woodfine's letter in your issue of the 21st inst., I cannot allow the statement made to him by a representative of a certain Tube Company to pass unchallenged. There is no doubt that a large quantity of imported steel tubes have been sold as iron; and while certain makers have concentrated chiefly in the direction of steel tubes, others, like ourselves, have specialized in the manufacture of iron. The Midland Junior Gas Association, who visited our works, were assured on this point.

As a matter of fact, we do advertise in the Technical Journals as makers of genuine Staffordshire puddled iron tubes, and do definitely guarantee them as such. We should be delighted at any time to prove this to any gas engineer who will honour us with a visit. We have continually since 1872 manufactured puddled iron tubes; and I do not see how any representative of a Tube Company who knows his job could make a statement of this sort. If it is not done through ignorance, then I am convinced it is done with the idea to deceive, and, to say the least, is very unfair competition, and despicable to the last degree.

Per pro Wellington Tube Works, Ltd.,
J. T. White, General Manager.

Great Bridge, Tipton, Staffs.,
April 22, 1926.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Halifax Corporation Bill: Read the third time, passed, and sent to the Commons.

Special Orders.

The Special Order proposed to be made on the application of the Brentwood Gas Company was last week referred to the Special Orders Committee.

Smoke Abatement Bill.

The House of Lords, sitting in Committee on Thursday, April 22, further considered the Public Health (Smoke Abatement) Bill. We give an outline of the portion of the proceedings in which readers of the "Journal" are more particularly interested.

Earl De La Warr, in moving the insertion of the following new clause:

> It shall be the duty of a local authority on submitting proposals for the provision of houses for the purpose of the Housing Acts, 1890 to 1924, to satisfy the Minister that suitable arrangements are to be made for heating or cooking as are calculated to prevent or reduce the emission of smoke,

said that there could be no reason why the Ministry of Health should not have power to exercise some supervision in this matter. Several of the largest municipalities, such as Leeds, had already dealt with this matter, with the greatest success, in the way suggested.

Viscount Gage stated that the Minister was opposed to placing restrictions on the discretion of local authorities, or interfering with the ordinary domestic habits of the people. As a matter of fact, he said,

great progress had already been effected without compulsory measures in connection with housing schemes in the installation of gas in place of coal for cooking. As a result of returns recently obtained from a number of sample local authorities, it appeared that in 75 p.ct. of their houses gas cooking apparatus was provided for, and was, in fact, generally used.

Lord Banbury, in opposing the amendment, thought that to make compulsory the provision of gas or electricity for heating and cooking would make the houses now being built still more costly.

The Marquess of Salisbury said he sympathized with the efforts of Lord Newton to abate the smoke nuisance; but in his opinion there was nothing more valuable than the open fire. He could not support an amendment which tended to abolish it. So far as private houses were concerned, the real solution of the problem was the perfection of smokeless fuel. The amendment was rejected.

HOUSE OF COMMONS.

Progress of Bills.

Ascot District Gas and Electricity Bill, Darwen Corporation Bill: Passed for second reading.

Halifax Corporation Bill: Read the first time, and referred to the Examiners.

The petition of the Mid-Kent Gas Light and Coke Company against the Southern Railway Bill has been withdrawn.

Smoke Abatement.

Replying in the House of Commons, on the 22nd inst., to Lieut.-Commander Kenworthy on the question of smoke abatement, Mr. Chamberlain said that the Government had not considered it advisable to go beyond the proposals contained in the Bill introduced in another place. The solution of the domestic smoke problem was generally considered to depend chiefly on the production of a smokeless fuel at an economical price.

Lieut.-Commander Kenworthy asked the Minister of Health whether, having regard to the dangers and wastefulness of raw coal burning methods emphasized in the Report of the Royal Commission on the Coal Industry, 1925, and to the appeal recently made to householders by the Ministry of Health to use smokeless fuel wherever possible, the Government would consider the desirability of giving legislative sanction to local rating authorities to make an appreciable rebate from the appropriate rate to owners or occupiers of all dwelling-houses equipped exclusively with smokeless heating and cooking appliances.

Mr. Chamberlain stated that the Government did not see their way to introduce legislation to this effect. He further added that they were doing all they could to encourage research into the question of providing smokeless fuel.

Gas Mantle Imports.

In the House of Commons on Tuesday of last week, Mr. H. Williams asked the President of the Board of Trade the quantity and value of gas mantles imported during the three months ended March 31 during the years 1924, 1925, and 1926.

Sir P. Cunliffe-Lister replied that the imports of gas mantles were as follows:

	Gross.
First quarter of 1924	48,000
" " 1925	45,000
" " 1926	12,000

The values of these imports were, respectively, £41,000, £48,000, and £14,000.

MYNYDDISLWYN URBAN DISTRICT COUNCIL BILL.

This Bill was considered last week by Section B of the Local Legislation Committee of the House of Commons (presided over by Colonel Sir Joseph Nall). It contains a number of gas clauses of a general character [see "Journal" for Jan. 20, p. 162], to which there has been no substantial alteration.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There has appeared in the "London Gazette" the following notice regarding an application to the Board of Trade under the Act.

SPECIAL ORDER.

Colwyn Bay Urban District Council.

To extend the limits of supply, to authorize a differential charge within the added area, to use scheduled land for gas purposes, to permit of the borrowing of further money, &c.

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The Gas Referees' reports of the official testings for the past quarter under the provisions of the Gas Regulation Act give the following average calorific values for the Metropolitan Companies named.

Commercial Gas Company.—481·5 B.Th.U. (declared calorific value, 475 B.Th.U.).

Gas Light and Coke Company.—502·2 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—563·2 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—501·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Tottenham District Light, Heat, and Power Company.—502·4 B.Th.U. (declared calorific value. 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—473·3 B.Th.U. (declared calorific value, 470 B.Th.U.).

GAS-WORKS STRIKE AT GLASGOW.

As mentioned in last week's "Journal," the strike of workers employed in the Gas Department of the Glasgow Corporation ended on April 12, and all the men involved have returned to duty. It was stated that inquiry would be made into the cases of the men whose dismissal from the service was objected to by the workers, and into any other grievances which might be put forward, and that a Special Committee had been organized to deal with the matter.

The following are the findings of this Committee, as reported to the Gas Committee on April 20. It will be observed that the Committee unanimously justified the action of the management, and left the question of the reinstatement of the dismissed men in the hands of the General Manager, as was suggested to the men on March 17.

Report by Special Sub-Committee.

(1) That employees in the distribution section of the Gas Department, as the result of a practice which had grown up therein, have for many years been in the habit of resorting to plumbers' shops, without serious objection until recently on the part of the management, for the purpose ostensibly of borrowing shortages in material, procuring the use of tools, taking of meals, &c., and that the custom has resulted in abuses and practices which ought to be stopped.

(2) That the management, having been anxious for some time past to put an end to the said practice and its resulting evils, issued on Nov. 10 last, and posted on the usual official notice board at Wall Street, an order forbidding the use of plumbers' shops for any reason whatever, and intimating that any men disregarding the instruction would be liable to instant dismissal; that inspectors and foremen have signed a statement testifying that they called the attention of the men under them to the terms of the order; and that, notwithstanding these and other measures, the employees or some of them failed to observe the order.

(3) That the management, with a view to stopping the custom referred to, were fully justified in making and enforcing, by admonition, suspension, and dismissal, the order forbidding the use of plumbers' shops.

(4) That in the cases—six in number—of the dismissed men the order had undoubtedly been disobeyed, though some of the men maintained that they had no knowledge of the existence of the order. There was also evidence to show that working cards had been inaccurately filled up.

(5) That two of the dismissed men have been in the service for 12 and 13 years respectively, that the others have a short service of 2 or 3 years, but that, apart from disobeying the order in question, or inaccuracy in the filling up of working cards, the record of service of these men was not challenged or any other charges of irregularity brought against them.

(6) That, in all the circumstances, the men have been sufficiently punished for their acts of disobedience or irregularity by being deprived of their employment for the periods (varying from four to eight weeks) they have respectively been out of the service.

(7) That a suggestion made by the management to a deputation of the men on March 17—that provided the order be complied with unconditionally, and loyally observed in the future, the question of reinstating the men would be considered—should now be implemented by the management; and the Special Sub-Committee recommend accordingly.

It was further agreed that a meeting of the Special Sub-Committee be convened for April 26, to consider the procedure with regard to the other questions in the list of general and individual grievances submitted on behalf of the employees.

Benzol and By-Products, Ltd.—Presiding at the annual general meeting of the Company, Sir A. Henry McMahon, G.C.M.G., G.C.V.O., said that the profit and loss account covering the period from Oct. 1, 1924, to Sept. 30, 1925, after taking into account development work charged to revenue, depreciation, management commission, and all other charges, including the sum of £8000 set aside for income-tax reserve, showed a net loss of £9469. In the previous period there was a profit of £30,344. Bringing forward the profit balance of £55,836 from that account, and adding £2078 as reserves written back, there was a total of £57,915. Deducting the loss of £9469, preference and ordinary dividends amounting to £28,414 (confirmed at the last annual meeting), also £7920 representing the preference dividend paid on April 1, 1925, there remained a net profit balance of £12,111 to be carried forward to the next account. The loss was due to factors almost universal in the colliery industry—namely, the heavy fall in average selling prices, labour uncertainties, and foreign competition, owing to adverse working hours and conditions. Had international output restrictions been put into operation, or any Governmental safeguarding measures adopted to protect the blast furnace industry, they would have sold coke at a profit. Coke sales depended largely on the steel and iron manufacture. If, owing to foreign competition, blast furnaces closed down, they lost the principal outlet for coke.

BRIGHTON AND HOVE GAS ORDER.

The application of the Brighton and Hove General Gas Company for an Order under section 10 of the Gas Regulation Act was heard by Mr. J. F. RONCA (Director of Gas Administration), at the offices of the Board of Trade, on Monday, April 19.

Mr. CRAIG HENDERSON, K.C., appeared as Counsel for the promoters; and there were also present Mr. E. L. Burton (Secretary) and Mr. C. H. Rutter (Engineer and Manager) on behalf of the Company. The opponents were the Shoreham, Southwick, and Portslade Urban District Councils, who were represented by Mr. JOSHUA SCHOLEFIELD, K.C., instructed by the respective Clerks of the opposing Councils, and Mr. Arthur Valon, Consulting Engineer. Sitting on the opposition side of the table also were Mr. J. H. Rothwell (the Brighton Town Clerk) and Mr. H. M. Stevens (the Brighton Borough Accountant), although the Brighton Corporation, as a matter of fact, actually supported the Order in the form in which it came before the Director—certain amendments having been made to meet their objections.

The Order contains provisions for the conversion of capital and an extension of area; and it also includes a number of clauses of a general character, and one or two which were described by the opponents as novel, to which reference was made during the proceedings.

Mr. CRAIG HENDERSON explained that there was at present a total paid-up of standard 10 p.ct. original ordinary consolidated stock amounting to £214,740, and standard 7 p.ct. "A" ordinary consolidated stock amounting to £244,200; and it was proposed to convert the former into standard 6 p.ct. stock, giving £166 13s. 4d. for every £100 of existing 10 p.ct. stock. The 7 p.ct. existing "A" stock was to be converted into 5 p.ct. stock; £140 13s. being given for every £100 of existing stock. Thus the £214,740 of 10 p.ct. original ordinary consolidated stock would become £357,900 of 6 p.ct. stock, and the £244,200 of existing "A" ordinary consolidated 7 p.ct. stock would become £343,467—making a total of the two classes of ordinary stock of £701,367, as against £458,940 at present. The exact equivalent in the case of the "A" stock would be £140; and the reason for making it £140 13s. was explained as follows: The present sliding-scale on both classes of stock involved in the conversion was 2s. 6d. p.ct. for every 1d. per therm up or down in the price. In the case of the conversion of the existing 7 p.ct. stock, the exact equivalent in the sliding-scale would be 1s. 9·4285d., which introduced, said Counsel, a rather awkward fraction; and therefore it was proposed to make the slide the exact 1s. 9d. for each 1d. per therm up or down in the price charged for gas, and to compensate the holders for the loss of this fraction by adding 13s. p.ct. to the conversion value. It was also proposed that the borrowing powers in respect of any ordinary or preference stock issued after the date of the Order—exclusive of capital issued for the purpose of any conversion of capital authorized by the Order—should be one-half of the amount (including premiums) which at the time of borrowing had been raised by the issue of ordinary or preference stock This one-half borrowing power took the place of the existing one-third; but it was explained that the Company had powers to borrow to the extent of one-half under a temporary Order made in 1921, which powers had expired. This proposal would have the effect of raising the borrowing powers from £341,895 to £397,500. Another financial proposal was to establish a renewals fund; and there did not seem to be any opposition to that. At the moment, the Company had a special purposes fund, which, however, could not be used for maintenance and renewals; and as this heavy item could not reasonably be borne out of any particular year's revenue, when the need arose, it was suggested that there should be a renewals fund. Originally it was proposed that an amount of 1 p.ct. per annum of the paid-up capital should be appropriated to this fund; but after discussion with the Brighton Corporation, it had been agreed to reduce this to ½ p.ct. As regards the application of excess profits, under the Company's Act of 1910 they were permitted to carry forward an amount not greater than a sum equivalent to one year's dividend; but by the present Order it was proposed to bring this provision into line with modern precedents by including also the sum required to pay interest on mortgages and debentures. In this way, the Company avoided the necessity of having to increase the price of gas during a time of financial stringency. When the Order was originally deposited, six new parishes were scheduled for inclusion in the Company's area of supply; but these had been reduced to three —viz., the parishes of Falmer, Stanmer, and Telscombe.

Dealing with the petitions against the Order, Counsel said the present Order did not seek any powers to vary the existing prices; but the outside authorities in question were asking for modifications in their favour. The Company's area consisted of an inner portion comprising Brighton, Hove, and Preston, in which the present standard price was 12d. per therm; while in the outer areas there were differential prices which were originally imposed in 1910. Thus in one part of Shoreham there was a differential of ⅜d. per therm, in another part of 1½d., and in the remainder of the Shoreham area of 2⅜d. In Portslade there were differentials of ⅜d., 1½d., and 3d. per therm. Southwick was included in Shoreham. Although the standard price was 12d. per therm, *plus* these differentials, the prices being charged in these areas were considerably lower, because the actual charge in the inner area was 9·5d. per therm, and the charge to the respective outer areas mentioned was therefore 9·5d. per therm, *plus* the respective differential. For the new areas proposed under the present Order, the differential asked was 3d., making a standard price for these new areas of 15d. per therm. The Company's standard price was reduced from 15·2d. to 12d. in 1924. One of the difficulties appeared to be that the northern boundary laid down by Parliament between the ⅜d. area and the 1½d. per therm area was the old Shoreham Road; and the Councils concerned in the present opposition said it was unfair that the residents on one side should pay the lower rate, while those on the other side had to pay the higher rate. There were no proposals in the present Order with regard to this matter; and the opponents were seeking to amend existing legislation, which was a very serious thing. There was also the suggestion that the differentials, in some cases at any rate, should be abolished altogether; but when one looked at the map, it was obvious that the Company could not supply these outer areas, as a commercial proposition, at the same price as was charged in the inner area. Moreover, there must be some boundary between the areas of the respective differentials; and whether it was the Old Shoreham Road or not, the same argument could be applied. What apparently was desired was to push-back the northern boundary beyond the Old Shoreham Road, and so increase the area of the lower differential, and then abolish the differential altogether. The consumption in Portslade-by-Sea was only 2·48 p.ct. of the total supply of the Company. Southwick represented 1·95 p.ct., and Shoreham 2·39 p.ct. The total consumption of Portslade, Southwick, and Shoreham together represented only 0·58 p.ct. of the total consumption, so far as the area north of the Shoreham Road was concerned. The Company's gas-works were in Portslade; but the chief distributing centre was in Hove, with another holder station in Rottingdean. In addition to Portslade getting the advantage of the Company being large ratepayers, these three districts obtained their gas very much more cheaply than they would if it were not for the large supply given in Brighton, Hove, and Preston. Moreover, any reduction in the differential in these districts, which provided such a small proportion of the total, would fall upon the consumers in Brighton, Hove, and Preston. In addition to the agreement with the Brighton Corporation to limit the renewals fund to ½ p.ct. per annum of the capital issued, the following new clause had been added to the Order as affecting the reserve and renewals funds:

> The respective amounts by which the nominal amount of the 6 p.ct. per annum standard consolidated stock and the nominal amount of the 5 p.ct. standard consolidated stock into which the original ordinary consolidated stock and the "A" ordinary consolidated stock are converted in the immediately preceding section of this Order exceed the respective nominal amounts of the said existing stocks shall not be taken into account in calculating the annual sums which may be set aside or appropriated in any year to, and the maximum amounts of, the special purposes fund authorized to be established by the Brighton and Hove Gas Act, 1910, and the renewals fund authorized to be established by the Company by this Order.

This was a limitation on the total amount of these two funds, which had been agreed in order to meet the objections of the Brighton Corporation.

Mr. *E. L. Burton* (Secretary of the Company), in evidence regarding the existing special purposes fund, said this was expressly prohibited from being used for the purpose of renewals; and, as showing the importance to the Company of having such a fund, he pointed out that during the past few years it had been necessary to spend £150,000 upon renewals and reconstruction. But the funds were not available; and £132,000 had to be raised at a time when it was very difficult to borrow money—7 p.ct. debenture stock being issued for the purpose. This stock would have to be redeemed; and it placed the Company in an unfortunate position. He did not believe there was an engineer or accountant of any standing who would raise an objection to this proposal. There were numerous precedents for the clause relating to the application of excess profits, including the amount required for mortgage and debenture interest.

Witness, cross-examined, said that 12·6d. per therm was the permissible standard in part of Shoreham south of the Old Shoreham Road; but the charge was only 10·1d. per therm. In Bungalow Town, the Company could charge 11·9d. per therm, but were only charging 10·7d. He justified the extra charge in both cases by the extra cost of supplying these areas, and the fact that in Bungalow Town the demand was largely a summer one. The Company could not exist on a summer demand alone. In the case of the Old Shoreham Road boundary, he felt the Councils might have a legitimate grievance in that persons on one side paid a different charge from those on the other; and having regard to the development now taking place north of the Old Shoreham Road, he believed the Company would be willing to extend the boundary of the ⅜d. per therm differential a distance of a quarter or half a mile. He did not, however, wish this to be embodied in the Order, for the reason that it had always been the policy of the Company to adjust prices according to conditions; and if it were left to arrangement between the Company and the Councils as circumstances warranted, there was likely to be much greater development and consideration for the consumers. The justification for a differential was the extra cost of supply as compared with the inner districts. He had no figures in support of his statement that it cost more to supply in the outer areas which were opposing the Order.

Mr. SCHOLEFIELD suggested that the reason why the Company had not paid the full dividend they were entitled to in one or two cases was that this would indicate that the standard price was too high.

Witness repudiated the suggestion, and said that in the few cases when the full permissible dividend had not been paid it was due to the prudence of the Directors in conserving the finances of the Company. He also differed from Counsel's view as to the reason for converting the capital being to disguise the fact that a higher dividend than the standard was being paid upon a certain proportion of the stock. Investors preferred to buy a stock near par bearing a lower rate of interest. They were often afraid that a high dividend-bearing stock would not maintain its position.

Mr. SCHOLEFIELD then referred to the clause providing that where premises are let furnished for less than six months, the owner should be made responsible for the gas used by the tenant, and asked for the justification for this.

Witness replied that it was because tenants of this class often went away without notice, and without paying their bills. He admitted

that the bad debts last year due to this cause were only £640, but did not agree that the difficulty could be got over by asking for a deposit. People might refuse to give a deposit, and then the Company would not furnish a supply; but the Company did not wish to refuse to give supplies, and he believed it was a reasonable thing to ask that the owner of the premises should be held responsible for the gas consumed.

Mr. *C. H. Rutter* (Engineer and General Manager of the Company) said the prices charged in Shoreham, Southwick, and Portslade, of just over 10d. per therm, compared with 1s. 4½d. in Bexhill, 1s. 4d. in Lewes, 1s. 5d. in Chichester, 1s. 4d. in Littlehampton, 1s. 1d. in Bogner, 1s. 1d. in Haywards Heath, and 11d. in Worthing.

Mr. Scholefield (in cross-examination) said it was no use comparing small places such as those mentioned with a large undertaking. He asked witness what was to be the position with regard to the differential if, as was possible, these areas on the fringe of Brighton developed to an even greater extent than Brighton itself.

Witness replied that the prices would be regulated according to conditions, as was being done at the present time. The Company were not charging anything like the full standard price at present. He referred Counsel (in justification of the differential) to the gas sold per mile of main, and pointed out that in the case of Bungalow Town and Lancing the quantity sold in 1925 was 2645 c.ft. per mile, whereas in the inner area it was 10,608 c.ft. per mile.

This closed the case for the Gas Company.

Mr. *Arthur Valon* was called as the first witness for the three opposing Councils. Speaking with regard to the differential, he said he felt the time had come, having regard to the development in the area in which the smallest differential now operated—namely, south of the Old Shoreham Road—that this differential should be abolished altogether. It was originally fixed in 1910, when the population and consumption were much less than at the present time; but now these districts were practically part of Brighton and Hove, and were within the same distances of the main distributing station at Hove as were many other parts of the area to the east. He took it that the Company would carry out the suggestion made that the ⅜d. per therm differential should become operative in an area from a quarter to half a mile to the north of the Old Shoreham Road; and having made that concession, he still contended that any area in which the ⅜d. per therm differential operated should be relieved from that differential. It was reasonable, however, for the Company to charge the existing differentials in the other areas, having regard to their conditions at the present time. Certainly there should be no differential in Bungalow Town, which provided a very useful load to the Gas Company in the summer, at a period when it was most needed. As a matter of fact the percentage rate of increase in some of the outer areas was greater than in the inner area; and while it had been suggested there were small towns not so favourably situated in the matter of price as these three urban districts, which were part of the large Brighton undertaking, there were others which were supplying more cheaply—for instance, Tonbridge, at about 8d. per therm. With regard to standard price, he believed 11·2d. per therm would leave the Company with a sufficient margin to pay their full statutory dividend. As to the renewal fund, although this was comparatively new, he saw no objection to it as long as it was used as a renewal fund, and not kept on one side for long periods, and only employed in emergencies. The conversion of capital, of course, was a common procedure; but he had not seen it carried out so clumsily as in this case, though perhaps there was no other way of doing it. As a matter of fact, the only advantage in these capital conversion schemes was to disguise the fact that the companies could pay a higher dividend than their standard dividend, though it was also an advantage to the company in being able to obtain capital a little more readily and at a slightly better price. He had no objection to the increased borrowing powers; but as to the clause authorizing the Company to discontinue supply in cases where they regarded the pipes, &c., as dangerous, he felt he hardly dare say what he really thought about this. He did not regard the clause as harmful so much from the point of view of his present clients as from that of the general interest of the gas industry, because he could not think of anything more likely to bring about conflict with consumers than taking compulsory powers to inspect pipes and force people to carry out repairs. If there were a maintenance scheme carried out by agreement, that was another matter; but here the Company were asking for powers to inspect premises and compel alterations to be made, and yet took no responsibility at all in regard to the matter. The clause relating to furnished premises he also regarded as undesirable.

Witness, in cross-examination, reiterated his views with regard to the proposed power of the Company to refuse supply in the case of dangerous fittings, and said it would be better to leave the householders responsible, because his experience was that, on the slightest smell of gas, people sent to the gas company to put it right. There was nothing in this clause which would prevent anything dangerous happening which might happen now. He felt that the clause would be ineffective, and at the same time undesirable, from the general interests of the industry. He also repeated his view that one of the effects of the conversion of capital was to disguise the fact that 12 p.ct. was being paid on 10 p.ct. capital.

Mr. Craig Henderson: Exactly in the same way as the London Companies have done?

Witness: Yes.

Mr. Craig Henderson then referred to Mr. Valon's views as to the standard price, and asked if he had any complaint to make of the efficiency of the management of the Company, and why, if he had, an application had not been made by his clients under section 1 for a reduction of the standard price.

Witness said he had no complaint to make of the management of the Company, which had a reputation for being a well-managed concern. At the same time he did not think the standard price had anything to do with management, because it was always fixed in relation to the circumstances at the time.

Mr. *Ernest Kemp* (Clerk to the Portslade-by-Sea Urban District Council) said that the area of his Authority was now completely built over, and there was no justification on the score of development for keeping the differential in existence any longer.

Mr. *J. E. Dell* (Clerk to the Southwick Urban District Council and Solicitor to the Shoreham District Council) gave evidence to a similar effect, and emphasized the point that Brighton and the three districts opposing the Order were now to all intents and purposes one continuous area, so far as the portion south of the Old Shoreham Road was concerned.

Mr. Scholefield, addressing the Director on behalf of the three Local Authorities, said the really important matter from their point of view was the question of the differential; and he asked that the ⅜d. per therm differential should be abolished, not only in the existing area, but in the extended area which had been offered by Mr. Burton. He also asked that the standard should be reduced to 11·2d. per therm; and, as to the powers to lay pipes for ancillary purposes, he asked that not only should the roads be specified, but that the Boundary Road should be definitely excluded from the roads in which such mains might be laid. A precedent for this was the Southampton Gas Order of 1925, in which case certain roads were specifically excluded. Finally, he asked that the power with regard to inspection of premises and refusal to supply where the Company thought the pipes and fittings were dangerous should not be granted, nor should the power to make the owner of premises let furnished liable for the gas supply taken by the tenant. Nothing would be more liable to create conflict between the Company and their customers than clauses of this character.

Mr. H. M. Stevens (Borough Accountant, Brighton), speaking in the absence of the Town Clerk, said the view of the Brighton Corporation with regard to the revision of the differential prices was that both they and the Hove Corporation ought to have been given some notice that this matter was to be raised, in order that they themselves might have considered the possible effect of any such alteration upon the consumers in Brighton and Hove. As it was, the Corporations had not been able to give the matter any consideration.

Mr. Craig Henderson, in his final speech to the Director, said the point with regard to furnished premises was that there were hundreds of these in Brighton and Hove let for short periods, to which the gas supply was already laid; but the Company received no notice of changes of tenancy, and frequently the tenants left without notifying the Company, and often left no address behind them. The clause dealing with dangerous pipes was in the public interest. As to the suggestion that the standard price should be revised, there was specific machinery in the Gas Regulation Act for dealing with such a matter, and yet, in respect of an application under section 10, the opponents, while admitting that the undertaking was efficiently managed, sought to obtain a reduction without having put forward all the detailed information called for in the case of applications for such reductions. He therefore resisted this suggestion as strongly as he possibly could, and submitted that, the standard price having been revised as recently as 1924, there was nothing in the evidence before the Director to justify any alteration being made now. As a matter of fact, the standard price was lower than in the majority of South Coast towns. As regards the differential prices, the position had now come down to a request that the ⅜d. per therm differential should disappear, and that the area in which there should be no differential should be extended in the manner offered by Mr. Burton, although this offer was meant only to extend the area of the ⅜d. differential. While again expressing the willingness of the Company to give effect to Mr. Burton's undertaking to increase the area of the ⅜d. differential, he was not prepared to agree to the suggestion that this differential should be abolished altogether. He gathered that the opponents did not now ask for any modification of the differentials in other parts of these areas; and so the question in this respect had been reduced to these two points. He felt, however, that nothing would be gained, and probably something would be lost, by including any modification of the differentials in any form in the Order, and urged upon the Director the desirability of leaving it to mutual arrangement from time to time as circumstances demanded. Otherwise it might mean repeated applications by the local authorities for modifications. If the ⅜d. differential were abolished, it would mean a loss to the Company of between £1800 and £2000 per annum, which would have to be met by the consumers in the central area, who at present provided the great bulk of the Company's income.

In addition to the matters discussed during the hearing, the Order also contains a clause giving the Gas Company the right to impose, subject to the consent of the Board of Trade, a specification or specifications with regard to the minimum size and materials of pipes and fittings; and it also includes several Model Bill clauses.

Gas Supply of Santos.—It was stated by the Chairman (Mr. N. B. Dickson) at the annual meeting in London of the City of Santos Improvements Company, Ltd., that the reduction of 30 p.ct. in the price of gas made some time ago continued to have a highly beneficial effect on the consumption. The total sales in the past year were nearly 18½ p.ct. more than in the previous twelve months. He expressed sincere appreciation of the services rendered by Mr. Bernard F. Browne and the other officers and staff in Santos.

Concession to Large Consumers at Hereford.—At a meeting of the Hereford City Council, the Gas Committee (having received communications from various consumers of large quantities of gas, asking for a reduction in the price) recommended the Council to make reductions of 3d. per 1000 c.ft. to consumers of over 250,000 c.ft. per annum, and 6d. to consumers of over 500,000 c.ft. per annum, the reductions to operate from March 25 last. The recommendation was agreed to.

COLOMBO GAS AND WATER COMPANY, LTD.

The Annual General Meeting was held at the Company's Offices, 148, Gresham House, Old Broad Street, E.C., on Monday, April 19—Mr. STRACHAN C. CLARKE, Chairman, presiding.

The SECRETARY (Mr. A. C. Pullen) read the notice convening the meeting, and the Auditor's report.

The CHAIRMAN: Gentlemen, a copy of the report and statement of accounts having been sent to all the shareholders, I will ask you to take them as read.

The total gas sold during the year was 162 millions, as compared with 143 millions in 1924—an increase of about 13 p.ct. A pleasing feature, and one to which I would draw your special attention, is that our business in gas for lighting continues to go ahead, and the Board have particularly pointed out, in the report, the fact that the gas sold for lighting in 1925 was 45 p.ct. more than it was five years ago. In this country we are constantly told that gas for lighting must give way to electricity. I can only suggest that the methods of this Company in the tropics may be worthy of emulation. How is it that we can increase our lighting trade at a place like Colombo? The number of cookers in use, either sold or on hire, increased by 73 p.ct. during the year, and the scheme we have instituted of fixing cookers entirely free to consumers is fully justified; a moderate rental being charged for the cooker itself.

I referred at our last annual meeting to the fact that the alteration and extensions at our works had been completed, and that we had sufficient plant to meet the gas requirements of Colombo for many years. The addition of £3972 to our capital account is mostly for extensions to the mains. During this year, one of the holders will be remodelled and enlarged at a comparatively small cost, in accordance with a scheme prepared by the Company's Manager. Reference to the capital account will show that we paid off debentures during the year amounting to £3350. For special reasons we renewed bonds for a small amount, and the total debenture debt amounted on Dec. 31 to £4250.

The cost of coal carbonized shows considerable reduction. The quantity used was slightly less, through better working, although our trade increased. Further, the freight rates from Calcutta were lower. We have fixed a coal contract for 1926 and 1927 at a reduced price; and I am glad to say that our gas rates were, in consequence, lowered considerably as from April 1. The make of gas per ton has much increased, and for the first three months of 1926 it averaged 17,000 c.ft. of 450 B.Th.U. I am sure you will agree that these figures continue to reflect the greatest credit on our Manager, and year by year the working results show continued improvement.

Wages and salaries account is higher, but in 1924 our workmen were largely engaged on extension work. Bonuses are paid on profits to all local employees from the Manager to the lowest workman, and the scheme continues to prove highly successful. A provident fund for the local staff has been inaugurated as from Jan. 1 last. Maintenance of works and plant is somewhat higher, mostly on account of labour.

Trade charges increased from Rs. 8499 to Rs. 17,731, but of this increase, Rs. 6586 is for higher cost of advertising. Particular attention is paid to propaganda work, and the Manager sketches designs, &c., for advertisements, specimens of which are in another room for your inspection. "Fixing cookers" account increased from Rs. 8223 to Rs. 19,437, the results of which are reflected in our increased business.

On the credit side of the revenue, "gas rentals" account was Rs. 726,496, as compared with Rs. 684,343—an increase of Rs. 42,153, in spite of the prices of gas being lowered on April 1, 1925. Residual products produced Rs. 23,038 less, as our prices for coke were cheapened. You will see by the accounts that the residuals, after deduction of all charges for labour, cartage, barrels, &c., produced 85 p.ct. of the cost of the coal. I may here mention a fact which I am sure will be of interest to you. Commencing from the current month, we are hoping and expecting that the payments we receive from residuals will amount to more than the cost of the coal. If our hopes in this respect are realized, it will be almost, if not quite, an unique position for a gas company. This will not have been effected without strenuous effort. Our Secretary conducts the negotiations for coal in London, with the Manager's co-operation. Then there are the persistent efforts of our Manager and staff at Colombo, in the disposal of our residuals. The credit to "gas fittings" account was much the same as before.

We have charged to revenue the cost of the legal and printing expenses connected with the New Articles, issue of bonus shares, &c.; and you will agree with me that the work was performed at a very low cost.

Exchange account shows a considerable credit, arising from adjustments of remittances and shipments. The assets remain in the Company's books at 1s. 4d. per Rupee, although the rate on Dec. 31 was 1s. $6\frac{3}{16}$d.

I think these comments are all that I need make on the accounts; but I shall be pleased to answer any questions you may wish to ask regarding the same.

The balance of net revenue is £30,770 2s. 1d., and the Directors recommend a final dividend of 3½ p.ct. on the preference shares, less tax, and a final dividend on the ordinary shares of 5 p.ct. free of tax, also that £10,000 be added to general reserve.

You are aware that extraordinary meetings of the Company were held during last year for the purpose of approving new Articles of Association and for increasing our nominal capital, the shares being converted from £10 each to £1 each. The scheme for issue of bonus shares to the holders of ordinary shares was duly approved, and was carried into effect. An official quotation on the Stock Exchange for our shares was granted by the Stock Exchange Committee on Dec. 29 last, and the shares are at present at a substantial premium.

From advices just received, our output of gas for the first three months of 1926 had increased by 12½ p.ct. over corresponding period of 1925.

For several years we have been negotiating for an extension of the gas lighting to Dehiwela; and towards the close of last year we received an order from the public authorities to proceed with the work. Our mains on the coast line will then reach a length of about seven miles in a southerly direction.

Ceylon had a prosperous year in 1925, and we must hope that the island will continue to progress industrially and in other ways. The Government are pursuing the hydro-electric scheme, but we hope to consolidate our position at Colombo before the scheme is actually working.

I conclude, as I did last year, by referring again to Mr. Johnson, our Manager at Colombo. The working results are quite exceptionally good, and the Board are most pleased with the whole-hearted service that Mr. Johnson gives to the Company, and the material economies which he effects. He was here on leave during a part of last year, and spent a great deal of his holiday in studying how further improvements could be effected in the Company's business at Colombo.

With these remarks, I have pleasure in moving that the report and accounts be received and adopted.

Mr. JOHN G. WARDROP seconded the resolution.

Mr. ALFRED W. OKE said he had attended a good many meetings, of gas companies, but never for a more successful company, and he congratulated the Board on its policy. The increase in sales of gas for lighting was astonishing; and English companies might look to and emulate Colombo. It makes our mouths water to hear of the expectancy that residual receipts would pay for the coal.

Mr. A. J. KINGDON remarked that the Board were to be congratulated on such favourable contracts for coal being made, and at being able to bring forward such a report and accounts, praise for which was due to all concerned. Much credit was due to the Engineer for obtaining such excellent results. He would like to know of any other works where the residuals (after paying for labour, cartage, &c.) produced 85 p.ct. of the coal cost.

The CHAIRMAN, having replied to questions, then put the motion to the meeting; and it was carried unanimously.

The CHAIRMAN then moved the following resolution:

> That a dividend for the year ended Dec. 31, 1925, at the rate of 7 p.ct. per annum upon the preference shares, less income-tax, and 10 p.ct. per annum upon the ordinary shares, free of income-tax (both less interim dividend paid on Oct. 1, 1925) be and is hereby declared, the warrants to be payable on April 28, 1926.

This was seconded by Mr. ROBERT H. GLEN, and carried unanimously.

The CHAIRMAN then proposed the re-election of Mr. Alex. A. Johnston as a Director, and testified to the great assistance that the experience and technical knowledge of Mr. Johnston were to the Company.

Mr. JOHN G. WARDROP seconded the motion, and associated himself fully with the Chairman's remarks. The resolution was unanimously carried.

Mr. JOHNSTON, in returning thanks, said that in coming into the Colombo Company he had found a very happy family, and it certainly was the most prosperous gas company with which he had been associated. They had works in excellent condition which would not require much money for further extensions. The works were about as well equipped and provided for as any he knew, with a very able Engineer, whose results were exceptional. There was no reason why the prosperity should not be continued.

Mr. A. J. KINGDON proposed the re-election of Mr. William Cash as Auditor for the current year, which was seconded by Major HERIOT R. GLEN, and carried unanimously. Mr. WILLIAM CASH, Junr., responded.

Mr. SYDNEY J. TUNGAY proposed a vote of thanks to the Chairman and Directors, the Secretary, and Manager, which was seconded by Major GLEN.

The CHAIRMAN responded, and the proceedings then terminated.

TRADE NOTES.

Ferro-Concrete.

Messrs. K. Holst & Co., of 1, Victoria Street, Westminster, S.W. 1, have published a brochure which indicates, by photographs of some typical structures the firm have erected, the nature of the service they are able to offer in connection with ferro-concrete work.

"Clarkene."

"Clarkene" is the new name which Clark's Lead and Colour Works Company have given to "Taroclen." The reason for this change is solely because the latter clashed with the name of a product made by another firm. "Clarkene," we are assured, will maintain the high standard of quality which characterized the same product under the former name "Taroclen."

Useful Desk Adjunct.

We have received from Messrs. Firth, Blakeley, Sons, & Co., Ltd., of the Vulcan Ironworks, Church Fenton, Leeds, an extremely neat metal ash tray, with copper finish. In the base is stamped a two-lift spiral guided gasholder. It will be useful for the desk.

Further Woodall-Duckham Verticals for Adelaide.

The South Australian Gas Company have placed an order for an installation of Woodall-Duckham vertical retorts for the City of Adelaide. The plant will be capable of carbonizing 160 tons of coal a day. This will be the third installation of this system to be erected on these works. Messrs. Gibbons (Australasia), Ltd., the licensees for the Woodall-Duckham Companies, will erect the plant.

WORKS COUNCILS AND WORKMEN DIRECTORS.

Experience of the South Metropolitan Gas Company.

In connection with a week-end conference in Birmingham on "Co-Partnership in Industry," which took place on April 17 and 18, under the auspices of the Labour Co-Partnership Association, Mr. Walter T. Layton, who is well known as the Editor of the "Co-Partnership Journal" of the South Metropolitan Gas Company, gave an account of the experience of that Company in connection with Works Councils and Workmen Directors.

He explained that a Livesey Co-Partnership Committee is composed of a number of elected representatives of the workers, and an equal number of members nominated by the Directors of the Company; nearly all the nominated members being co-partners actively engaged in the business. At the present time the nominated members of the Committee comprise the President of the Company, the Vice-President, one Director, the General Manager, the Secretary, the chief officers of the various works and departments, and other officers and workmen, including about ten foremen. The membership to-day numbers 72—36 elected representatives, and an equal number of the Company's nominees. Thus is provided an opportunity for the discussion of all matters affecting the co-partners. No executive power is inherent in the Committee. It is essentially a consultative body; but by consent of the co-partners and the management it administers certain funds.

Mr. Layton gave particulars of the Jury System, which was described in the "Journal" for April 7 last, p. 53, on the occasion of a lecture by Mr. R. C. Macdonald (the Company's Chief Mechanical Engineer) before the Industrial Section of the London "Safety First" Council; and he then explained the origin of direct representation of the workmen-shareholders on the Board of Directors. In this matter Sir George Livesey had to overcome strong opposition from influential quarters—which opposition was not to be wondered at. "Even to-day," said Mr. Layton, "after over thirty years of more than satisfactory working, the idea does not find favour even with co-partnership gas companies. Out of over forty gas undertakings in which co-partnership on the Livesey lines has been adopted, one only—the South Suburban Gas Company—has taken up the Workman Director principle, and that Company had Livesey as Chairman." On many occasions Sir George Livesey bore testimony to the help which the Employee Directors had given to their colleagues, and to the breadth of view they had shown in the consideration of questions of policy and administration.

For the realization of the full co-partnership ideal, Mr. Layton contended that the Works Committee is essential, and the Workman Director is of hardly less importance.

ARBROATH GAS CENTENARY.

Councillors Visit Corporation Works.

On the occasion of the centenary of gas lighting in Arbroath, the members of the Arbroath Town Council, on the invitation of the Gas Committee, inspected the Corporation Gas-Works last Thursday.

The party, which included Provost Robertson, Bailies Milne and Beatt, Treasurer Macdonald, Dean of Guild Clark, Councillors Sherriffs, Corsar, Anckorn, Littlejohn, King, and Bruce; Mr. R. Finlayson, Town Clerk; and Mr. E. F. Cobb, Town Chamberlain, were shown over the works by Mr. A. C. Young, the Gas Manager, who explained in detail the working of the plant.

The members of the Council were each provided with an interesting descriptive account of the works prepared by Mr. Young, in which it was explained that on Feb. 13, 1826, shops and factories in Arbroath were for the first time lit by coal gas, then manufactured and supplied by a company. The existing works, it was stated, are on their original site. During the past hundred years the works have been altered and enlarged several times. The area covered by them has also been extended, and there is no part of the original plant of a hundred years ago now in existence. Mr. Young mentioned in detail the many alterations and improvements which have been carried out on the machinery and plant.

After the works had been inspected, Mr. Young entertained the visitors at tea. Provost Robertson, in thanking Mr. Young for his interesting description of the works, congratulated him on his able and successful management.

Mr. Young, in returning thanks, mentioned that he had now been Manager of the Arbroath Gas-Works for almost 25 years, and though during that time a large amount of money had been spent, the expenditure had repaid itself, the works to-day being in a sound position financially.

GLOVER-WEST VERTICAL RETORT CONTRACTS IN HAND.

The April issue of "West's Gas" (West's Gas Improvement Company, Ltd.) includes a summary of contracts for Glover-West vertical retorts in hand at the present time—some well advanced, while others are only in the initial stages—which reveals interesting and gratifying features. It is pointed out that of the thirty contracts included in it, no fewer than fifteen are extensions of existing installations or additional installations ordered by gas undertakings where the Glover-West system is already in operation, which means that the system is continuing to give satisfaction over periods up to fifteen years. The wide geographical distribution of the system is shown by the fact that no less than nine different countries are included in the list. In other words, "the Glover-West vertical retort has established a world-wide reputation, and, more important, has proved able to deal with coals of any and every kind, making gas to suit any and every standard requirement."

Certainly, the list represents a very large volume of work—and that during a period which would be termed, with some correctness, a time of industrial depression. Another reflection which is pointed out—and it is an important one—is "that this list of contracts is evidence of activity and progress in the gas industry which will encourage and justify the optimist and confound the pessimist."

Summary of Contracts in Hand.

At Home.

London—Gas Light and Coke Company, Nine Elms Station; the third installation of Glover-West vertical retorts for this Company.
Manchester—Partington Station; the fourth installation of Glover-West vertical retorts for this undertaking.
Leicester—Aylestone Road Station; the fifth installation for this undertaking.
Coventry—Second installation.
Liverpool—Extension by replacing the old by the "New Model" retorts in the second retort bench. The "New Model" retorts were built into the first bench last year.
Reading—Second installation.
Yeovil.
Macclesfield—An extension on similar lines to Liverpool.
Ellesmere Port.
Romford—Third installation.
Leven, Fife.
Northampton—Fourth installation.
Leek—Second installation; an extension of the plant completed last year.
Limerick, Irish Free State.
Barrhead, N.B.
Hoylake.
Middleton—Second installation.

Abroad.

U.S.A.: Fall River; Stamford, Connecticut; Portland, Maine.
South America: Buenos Aires, Argentina; Santiago, Chile.
Australia: Newcastle, N.S.W.—Second installation; Footscray, Victoria.
New Zealand: Wellington—Second installation; Dunedin.
Europe: Copenhagen, Valby—Second installation; Silkeborg, Denmark; Prague, Czechoslovakia; La Rochelle, France.

During the past month the seven-million installation at the Fulham Station of the Gas Light and Coke Company has been brought into operation. At the other end of the scale of magnitude is the extension at Holywood (Co. Down), where gas making commenced just before Easter.

VETERAN WORKERS AT STANTON IRON-WORKS.

The "Nottingham Evening News" recently invited manufacturers and industrialists in the Midlands to submit to them for publication the names of workers who had been in their continuous employ for a period of 40 years and over. The Stanton Iron-Works Company, Ltd., near Nottingham, employ some 14,000 workpeople, and were able to submit the names of 265 veterans who are still in their employ, who have served them for a minimum period of 40 years. The maximum period of service of any employee was 62 years; and no small number fell within the range of 45 and 55 years' service. The number submitted by the Stanton Company of 265 individual cases was by far the largest sent in by any single firm of employers.

The "Nottingham Evening News" subsequently had issued a printed certificate for each of the names included in their list; and during the past few weeks Mr. E. J. Fox (the Managing Director of the Stanton Company) has been presenting these certificates at the Company's various centres. The number of veterans at the Stanton Works totalled 86, at their Fleasley Colliery 59, at their Oakes (Riddings) Works 43, at their Holwell Works 41, and at their Teversal and Silverhill Collieries 36. At each of the centres the men were entertained to dinner in company with the members of the Employees' Works and Welfare Committee. Mr. Fox, in presenting the certificates, hoped that the younger generation would follow the good example set by their elders, and settle down to honest hard work—a life which had obviously been led by those to whom certificates were being presented.

SMOKE PREVENTION.

[Abstract of an Address by W. Nicholson, Chief Smoke Inspector to the Sheffield Sanitary Authority, delivered at Hull on April 24.]

About a third of the coal—80 million tons—consumed annually is wickedly wasted, and would be saved if a more scientific and sensible system were adopted in the burning of the fuel. Burned in the raw state, it shuts out 30 p.ct. of sunshine, produces at least 30 p.ct. of our fogs, adds greatly to artificial lighting and washing bills, destroys property, and costs the country approximately £4 per head of the population annually. It is, of course, impossible to evaluate the injury done to public health by breathing a poisoned air—health which is the nation's wealth.

Annually 40 million tons of coal are consumed in domestic grates, of which 50 p.ct. is wasted, and is responsible for 25 p.ct. of the smoke nuisance—not 75 p.ct. as frequently stated. The trouble could be practically prevented by the substitution of more modern grates, smokeless fuel, coke, gas, electricity, central heating, &c.

Eighty million tons of coal are consumed by boilers, which account for 30 p.ct. of the nuisance. There is no need for boilers to make black, or even dense brown, smoke, if there exist sufficient boiler power, good draught, frequent light firing, and skilled and conscientious stokers.

Similarly, there is no necessity for steam wagons, &c., to emit dense brown smoke.

As for furnace smoke, 120 million tons of coal are consumed by

furnaces, which contribute 45 p.ct. of the smoke nuisance. Furnace smoke generally is emitted at a criminally low level compared with boiler smoke, the height being from 25 to 35 ft., instead of 80 ft., 100 ft., or more. Eighty per cent. of the smoke now made by furnaces can be prevented by modernizing them.

PRESENT AND PROSPECTIVE SMOKE LAW.

The present smoke law, general and local, requires all furnaces and fireplaces to be so constructed and worked as to consume the combustible used therein, and prevent as far as practicable the emission of black smoke. In default, there is a penalty of £5, magistrate's order to abate the nuisance. For disregard of the order, there are daily penalties of 10s., 20s., and 100s.

The prospective Smoke Abatement Bill, which passed its second reading in the House of Lords on March 23 last, proposes power to proceed against smoke other than black. Smoke also includes soot, ash, grit, and gritty particles; and the penalties for default are increased from £5 to £50, 10s. to 40s., and 20s. to 100s. The Bill gives continued exemption to the domestic fire, chimneys belonging to the Government, and ships, and extends the exemption of furnace smoke in section 334 of the Public Health Act, 1875, to include reheating, annealing, hardening, forging, converting, and carburizing furnaces, and those for smelting ores and minerals, calcining, puddling, rolling of iron or other metals, and the conversion of pig iron into wrought iron. These exemptions are not necessary, and statutory power ought not to be given to make unnecessary smoke, for it is against the interests of the manufacturers, being a waste of coal, and creating a nuisance that ought not to be tolerated.

ADMINISTRATION OF THE LAW.

Of the local authorities, 95 p.ct. have done absolutely nothing in the direction of smoke law administration. The 5 p.ct. have done much abatement work; and Sheffield, constantly slandered by being called the greatest of all smoke nuisance sinners, has done as much abatement work, if not considerably more than, any of the 5 p.ct. In 1905, Sheffield had more sunshine than ten of the largest manufacturing towns, and the sunshine records have been sustained, for in 1925 Sheffield had more sunshine than London, York, Leeds, Bradford, Nottingham, Birmingham, or Manchester. The death rate is lower than that for England and Wales.

DEFAULTERS.

The 95 p.ct. of smoke prevention defaulters consist of manufacturers, managers, engineers, firemen, members of local authorities, medical officers of health, and, last but not least, sanitary inspectors. It is alleged that in the fourteenth century a man was hanged for a smoke nuisance. If all responsible for smoke nuisances to-day had to be hanged, many more lampposts would be required.

The Sanitary Inspectors' Association deserves hearty congratulations for establishing a complete course of smoke abatement lectures, to qualify sanitary inspectors to do smoke abatement work, which will shortly be carried out nationally.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 26.

Tar products generally continue unchanged.

Business in pitch for this season is practically at an end; but the price is steady at about 87s. 6d. per ton. Shipments July, 1925, to March, 1926, total 332,800 tons, as against 255,786 tons for the corresponding period 1924-25. The total exported in March, 1926, reached the large figure of 81,348 tons, as against 45,751 tons exported in March last year. Stocks in the country must now be very small. There is not much doing at present for October/December shipment, the price for which period is nominal at about 80s. per ton.

Creosote is in demand, and is firm at 7½d. per gallon net and naked at makers' works.

Large orders for tar are being executed.

Tar spirits are without change at the prices last recorded.

Pyridine bases is quiet at about 18s. per gallon.

Tar Products in the Provinces.

April 26.

Markets for tar products generally have been quiet throughout the past week, and on the part of both buyers and sellers there appears to be a desire to await the clearing-up of the coal position.

Pitch is slightly easier, and sales have been made for next season at 70s. f.o.b., while under 75s. has been accepted for prompt delivery.

The market for creosote is steady; but here and there small parcels are reported to have been sold at something under prices ruling lately.

Water-white products are firm, and there is decidedly more demand for forward delivery.

Other tar products are neglected.

The average values for gas-works products during the week were: Gas-works tar, 49s. to 54s. Pitch, East Coast, 73s. to 75s. f.o.b. West Coast—Manchester, 65s. to 67s. 6d.; Liverpool, 66s. to 68s. 6d.; Clyde, 71s. 6d. to 73s. 6d. Benzole, 90 p.ct. North, 1s. 8½d. to 1s. 9½d.; crude, 65 p.ct. at 120° C., 1s. 1d. to 1s. 2d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 8½d. to 1s. 9½d. Toluole, naked, North, 1s. 8d. to 1s. 9d. nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 11½d. to 1s. 0½d. Creosote, in bulk, North, liquid, 6½d. to 6¾d.; salty, 5¾d. to 6d.; Scotland, 5⅝d. to 5¾d. Heavy oils, in bulk, North, 6⅝d. to 7d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

All loading turns are now full up to Friday midnight, so that new business is practically at a standstill. During the past week there has been little excitement, and no great rush for coal. Presumably home consumers are well stocked, and Continental buyers know they can get supplies elsewhere in case of a stoppage. If, on the other hand, there is to be a last-minute settlement, there will be very little trade for next month, as there has for some time past been little or no inquiry for any forward positions, owing to the uncertainty of the situation.

Quotations, which are mostly purely nominal, are 19s. to 20s. f.o.b. for Wear Special gas makes, and 18s. 6d. to 19s. for best qualities. Seconds have not been higher than 15s. 6d. f.o.b., which is little, if at all, better than three or four weeks ago. Coking coals have been quoted at 15s. 3d. to 15s. 6d. Bunkers have been in greatest demand, and 18s. has been done for best sorts.

It cannot be said that there has been any of the usual pre-strike excitement on the market, which is by no means a good sign for the future of the trade. It is felt that there will be serious loss of markets if a stop does come.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The protracted negotiations between the Government, the owners, and the miners have created an undecided opinion among coal consumers as to the near future outlook in respect of the coal trade. While the majority think there will be no stoppage, collieries report that they are fully booked for the remainder of the month, for all descriptions of fuel. In some instances prices have been advanced. Public utility works have accumulated stocks that will be sufficient for their requirements over the next two or three months.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 23s. to 23s. 6d.; washed smalls, 14s. 6d. to 15s.; rough slack, 10s. to 10s. 6d.; smithy peas, 19s. 6d. to 21s. 7d.; unwashed trebles, 17s. 6d. to 18s.; unwashed doubles, 14s. 6d. to 14s. 9d.; coking smalls, 9s 6d. to 10s. 3d. Derbysnire and Nottinghamshire—Top hards, 21s. 6d. to 22s. 6d.; washed smalls, 12s. 6d. to 13s.; rough slack, 10s. 6d. to 11s. 6d. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 18s. to 20s.; gas coke, 19s.; furnace coke, 16s. 6d. to 17s. per ton.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

There has been rather more activity in the market as the subsidy period has drawn near its close. Nevertheless there has been no excitement. Demand has generally been balanced by supply. Slacks, beans, and nuts have hardened in some cases to the extent of sixpence or a shilling; for the rest, values have been stationary apart from purely local adjustments. The strengthening of stocks has received attention both from the manufacturer and the householder. It does not appear that any extensive precautions have been taken in the heavy trades. There is a widespread feeling that the closing of the pits would involve such an industrial upheaval that it would be useless to attempt to stave off the inevitable. There is the further feeling that in the present state of demand a suspension (always provided it did not last long) would not be an unmitigated evil. The effect of a conflict on future prices of iron and steel and other commodities is beyond calculation, and this uncertainty helps to confirm many industrialists in a passive attitude. They do not forget, moreover, that stocking coal against contingencies which may never eventuate has cost them dear before now. As some works in the Midlands emergency coal that was got in last July is still on the ground, and it stands as a pretty heavy debit on the books. The hard coke market has been uneventful.

CONTRACTS OPEN.

Purifiers, Machinery, House, &c.

The Gas Committee of the City of Stoke-on-Trent are inviting tenders for eight cast-iron purifiers, house, machinery, &c. [See advert. on p. 237.]

Coal.

The Sidmouth Urban District Council are inviting tenders for the supply of about 3200 tons of screened gas coal or large washed nuts. [See advert. on p. 237.]

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 21.]

Nos. 9537-10,178.

BROOKS, C. H.—"Gas rings, gas stoves, &c." No. 10,028.
FRANKFURTER GASGES.—"Gas burners." No. 9760.
GRAHAM, A.—See Brooks, C. H. No. 10,028.
JENNINGS, I. C.—"Rotary gas pump." No. 9629.
JONES, E. M.—"Gas mantle attachment. No. 9891.
MACINTOSH & Co., LTD., C.—"Gas, &c., valves." No. 10,006.
NEWTON, T.—"Process of impregnating coke with tars, fuel oils, &c." No. 9790.
RADIATION, LTD.—"Gas cooking apparatus." Nos. 9855, 9856.
RAMSAY, D. M.—"Distilling carbonaceous materials." No. 9788.
SCHUMACHER, E.—See Frankfurter Gasges. No. 9760.
UHDE, G. F.—"Purification of gases." No. 10,065.
WALKER, F.—See Macintosh & Co., Ltd., C. No. 10,006.
YATES, H. J.—See Radiation, Ltd. Nos. 9855, 9856.

Co-Partnership at Tunbridge Wells.

Convincing proof of the harmonious relations existing between the Tunbridge Wells Gas Company and their employees was afforded at the annual meeting of co-partners held at the Byng Hall on Friday last, under the presidency of the Chairman of the Company, Mr. Harold A. Beeching. The Chairman said that the number of co-partners was approximately 160, 119 of these holding stock in the Company to the extent of £2740 nominal, which represented about 20 p.ct. of the total number of stockholders. He had every reason to hope that the pension scheme would be successful, and that in 1935 it would be on a strong financial basis.

Fairy Gas Competition, 1926.

In addition to the usual £100 cash prizes offered in connection with the above competition this year, and for the past ten years, there will this year be offered an additional sum of £50 to be awarded as the first prize in the essay section of the competition in the form of a scholarship, to be known as the "B.C.G.A. Fairy Gas Scholarship." All children who compete in this essay section will be eligible for the scholarship, which will take the form of a grant-in-aid of education, the term "education" to be interpreted in its widest sense. The Committee will consider, in consultation with the parents or the guardians of the child, how the money shall be disbursed, so as to be of most benefit to the winner.

Gas Exhibition at Morecambe.—The display of the Morecambe Corporation Gas Department, said the "Morecambe Visitor" for April 24, is without doubt one of the marked features of the Trades Exhibition. Judging by the number of people attracted to the various stands, the Gas Department have the confidence of their consumers.

Devonport Gas Affair.—It is stated that the pending action for alleged libel which Mr. W. M. Carr, formerly Consulting Engineer to the Plymouth Corporation, is bringing against Mr. J. C. Tozer (Chairman of the Gas Committee) and Mr. L. R. Dunstan (a member of the Council), and which arises out of the recent trouble in the municipal gas undertaking at Devonport, will be heard at the Devon Assizes in June.

Public Lighting of the Borough of Finsbury.—The Gas Light and Coke Company have secured the contract for the lighting of the public lamps in the Metropolitan Borough of Finsbury for a period of five years. Under their scheme the Gas Company will convert the existing lamps (inverted burners with universal mantles) to superheated multiple burners with small mantles. There will be some 25 lamps added. There are about 1853 public gas lamps in the borough. The same electric lamps erected during the period when the matter was under discussion are to be removed. The burners and internal fittings of the superheaters are by Messrs. C. H. Kempton & Co., of Stangate House, Lambeth.

Gas Students Visit the Underground Streets of London.—A party of fifty students in gas supply of the Westminster Technical Institute, accompanied by Mr. E. L. Oughton, Senior Lecturer on Gas Supply at the Institute, and Sales Superintendent to the South Suburban Gas Company, visited the subways of the City of London, on Saturday afternoon last, in connection with the subject of mainlaying and distribution. The party were shown round by Mr. W. J. Liberty, Public Lighting Superintendent of the City of London, who explained the various methods of main and service laying in these underground thoroughfares. At the close, Mr. Oughton proposed a vote of thanks to Mr. Liberty.

Gas Light and Coke Company's Bill.—Last February the London County Council decided to oppose the Gas Light and Coke Company's Bill; and a petition was accordingly presented against it. The Bill seeks, among other things, to confer additional borrowing powers upon the Company, and to enable them to pay a minimum dividend of 5 p.ct. on the ordinary stock, whether or not, under the operation of the sliding-scale, the selling price of gas warrants the payment of such a dividend. As regards borrowing powers, the Company seek to raise loan capital up to a maximum of half the nominal amount of the ordinary and preference capital issued from time to time. After consultation with the Public Control Committee, the Parliamentary Committee of the Council decided to ask for an amendment to provide that, if the amount of capital proposed to be created is not spent within ten years, the unexhausted powers shall lapse. The Committee also determined to oppose the proposal to enable the Company to pay a minimum dividend on their ordinary stock.

Excuse for By-Passing a Meter.—That gas which had passed through a meter was unsuitable for his purpose was the excuse advanced at the Heywood Police Court on April 22 by John Glover, of Bridge Street, Heywood, who was fined £5 for abstracting gas from the pipes of the Heywood Corporation, at his workshop, in Shepherd Street, Heywood, on March 22. When an inspector visited the workshop he found a rubber pipe fixed to the main piping. It was asserted that this had occurred on two previous occasions. While admitting that the rubber pipe was attached on this date, the defendant denied that it had been before. He explained that for a considerable time he had been trying to work out something which would do away with gas mantles, and so reduce expense for everybody using gas. He had tried several methods, and got his arrangement almost perfect. He found that with the gas through the meter there was a certain amount of "clogging and damage," so, without thinking about committing a crime, he attached the rubber pipe. He had a good object in view, and thought it would eventually be a very good thing for everybody who used mantles. It was a great trouble to him to have to come to court.

Gasholder to Guide Airmen.

A large holder recently erected near the Ford flying field outside of Detroit serves as a guide and beacon for aviators. The holder, which has a capacity of 3 million c.ft., is of the type known as a "waterless holder," says the Pennsylvania Public Service Information Committee. It is of a uniform height, and does not move up or down according to the amount of gas it contains. It is the third of this type erected in the United States. When it was finished, it was suggested that it should be painted a bright colour, instead of the neutral grey that had been planned. It was also suggested that a white arrow should be painted across the top pointing toward the landing field. Accordingly, the tank was painted a bright red, and across the top was painted a huge white arrow, for the direction of mail fliers and other aviators. This arrow can also be illuminated at night by flood lights which serve as a direction guide for night fliers. Both the bright red tank and its white arrow are visible to aviators for many miles.

Barnet New Water Stock Issue.—Tenders for the £35,000 of "D" capital water stock (maximum dividend 7 p.ct.) offered by the Barnet District Gas and Water Company ranged from £111 down to the minimum of £105 p.ct., and amounted to a total of £55,377. The average price of allotment was £107 1s. 2d. p.ct.

Public Lighting Demonstration at Morpeth.—The Morpeth Gas Company have fixed six high candle-power lamps in the Market Place and the market extension site; and at the invitation of the Chairman and Directors of the Company, members of the Morpeth Town Council attended a demonstration of these lamps last Friday.

New British Standard Specifications for Paint Materials.—The British Engineering Standards Association have recently issued British Standard Specifications No. 217-1926, "Red Lead for Paints," and No. 242-1926, "Refined Linseed Oil for Paints." These specifications contain clauses regulating the composition, together with standard reception tests for the purchase of red lead and refined linseed oil, and appendices giving the methods of carrying out the tests. The specifications have been prepared at the request of the paint manufacturers, by a Committee representative of both buying and manufacturing interests. Copies may be obtained from the British Engineering Standards Association, Publication Department, 28, Victoria Street, London, S.W.1; price 1s. 2d. each, post free.

An Oft-Asked Question Answered.—Every once in a while some orator has this brilliant idea, says the Texas Public Service Information Bureau: "Why not generate all the electricity at the coal mine, and distribute it from there?" There are two reasons: (1) Electricity must be generated where there is plenty of water. An electric light and power plant requires 600 tons of water for every ton of coal, in order to supply the boilers and condense the steam. That is why you see the great electrical stations of our metropolitan cities, for example, located on the river front. Those stations draw from the river every day more water than is used by the whole city. Most coal mines are not near water. (2) At present the longest distance which electricity can be carried economically over wires—and compare favourably with local power—is 250 miles.

Bombay Gas Company, Ltd.—In the report to be presented to the shareholders at the ordinary meeting to-day, the Directors state that the revenue account for the year ended Dec. 31 shows a profit of £25,581, which, added to the profit on exchange £7418, and interest £180, and the balance of £34,209 brought forward from the previous year, amounts to £67,388. After providing for the payment of the interim dividend in November last, and the addition of £1569 to the reserve fund, £1046 to the renewal fund, and £195 to the insurance fund, the Directors recommend the payment of a dividend of 4 p.ct. (less income-tax), making 8 p.ct. for the year, which will leave £40,576 to be carried forward to the current year. Owing to continued ill-health and advancing age, Mr. Louis Penny has tendered his resignation as a Director; and for the same reason Mr. Charles Hunt has intimated that he does not seek re-election. Mr. Penny's connection with the Company extended over a period of 42 years. For 17 years he was Engineer and Manager in Bombay, being subsequently appointed a Director in 1902. Mr. Hunt joined the Board in 1905. The Directors desire to place on record their appreciation of the long and valuable services rendered to the Company by these two gentlemen. The Directors have appointed Mr. A. M. Paddon to a seat on the Board.

The rates of Padiham, near Burnley, are benefiting by £1205 from the Council's gas undertaking.

Two workmen at the Tunbridge Wells Gas-Works sustained serious injuries on April 20, due to the collapse of a wall. One of the men had to have a leg amputated.

It is understood that the whole of the public gas lamps in Hyde Park under the control of H.M. Office of Works are about to be fitted with automatic controllers manufactured by the Horstmann Gear Company, of Bath.

The Directors of the Monte Video Gas and Dry Dock Company, Ltd., recommend the payment on May 19 of a final dividend of 3 p.ct., free of tax, making with the interim dividend previously paid 5 p.ct., free of tax, for the year 1925, as compared with 4 p.ct., free of tax, for 1924.

The machinery and equipment manufacturers, together with all metal products manufacturers, in Chicago alone are said to have used more than 1750 million c.ft. of gas last year. This figure is an increase of approximately 100 p.ct. in the use of gas in these branches of the industry within the last three years.

STOCK MARKET REPORT.

The Stock Exchange continued last week in the dormant condition produced by the unsatisfactory coal situation and under the influence of possible Budget proposals. While at the time of writing an optimistic view predominates with regard to the former, any hopefulness of a settlement is tempered by the knowledge that at any moment the slightest rift in the negotiations may precipitate the national crisis which the Government and their advisers have for nine months been making every effort to avoid. The Budget proposals, so far as they were known, were less disturbing; and it was only a natural caution on the part of investors that affected the stock and share markets.

Gilt-edged stocks again improved, and the demand for Indian loans continued. The long expected £3,000,000 Glasgow Corporation Loan, which was underwritten on Friday, will be issued as a 5 p.ct. stock at par. Although the £1,000,000 African Railway and Finance Corporation 5 p.ct. stock at 99½ was successful, the surplus was comparatively small.

Industrials continued to beat time, and, apart from the interest shown in Swedish Match shares upon the successful year, there is nothing of outstanding interest to report. In the Insurance Market, Prudential shares were prominent. It is remarkable that in spite of the bad trade conditions of 1925, the report of this mainly industrial company should have been so successful.

There were more transactions recorded in the Gas Market, but prices showed no improvement. It will be seen that the changes in the quotations were principally in the shares of companies operating abroad. There was appreciably more activity in the Primitiva shares, which advanced by 6d. to 11s.-12s. The report of the Bombay Company exhibits a strong position. There was a surplus of nearly £4000 on the year's working, and the same dividend (8 p.ct.) is being paid. Two changes occurred in the stocks of English companies. The Gas Light ordinary depreciated further by ½ to 79½-81½; and South Shields consolidated by 4 points, to 117-119, on the Newcastle Exchange. This stock at the average prices realizes £7 4s. p.ct.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 70, 70½, Bournemouth "B" 12, British 103, 103½, 104, European 5 7/16, Gas Light and Coke 80¼, 80⅜, 80¾, 81, 3½ p.ct. maximum 59¼, Imperial Continental 139, 139½, 141, Primitiva 10s. 3d., 10s. 9d., 11s. 1½d., 4 p.ct. (Buenos Ayres) deb. 67¼, 67½, South Metropolitan 91½, 92, 3 p.ct. debenture 58½, 6½ p.ct. debenture 102¼, 103, South Suburban 5 p.ct. debenture 95½, Swansea 6½ p.ct. debenture 101, 101½, Tottenham "A" 108, Wandsworth (Wimbledon stock) 98. Supplementary prices, Leatherhead 4 p.ct. debenture 69, 69½.

On Tuesday, Alliance and Dublin 70⅞, Bournemouth "B" 12, British 103½, European 5½, Gas Light and Coke 80⅛, 80¼, 3½ p.ct. maximum 58½, 4 p.ct. preference 75⅝, 76¼, 76½, 3 p.ct. debenture 58, Imperial Continental 139, 139½, 139¾, 140, 141, Montevideo 75, 75½, Primitiva 10s. 10½d., 11s., 11s. 1½d., 11s. 3d., 4 p.ct. (Buenos Ayres) debenture 67½, South Metropolitan 91¼, 91½, 92, 3 p.ct. debenture 57¾.

On Wednesday, Commercial 4 p.ct. 80, European 5¼, 5 7/16, 5 7/16, Gas Light and Coke 80, 80¼, 80⅜, Hong Kong and China 20⅜, 20⅝, Primitiva 10s. 9d., 10s. 10½d., 11s., 11s. 1½d., 11s. 2¼d., 11s. 3d., South Metropolitan 91¼, 91⅜, South Suburban 97½, Tottenham "B" 88, Wandsworth (Wimbledon Stock) 97. Supplementary prices, Eastbourne 3½ p.ct. "B" 103, 103¾.

On Thursday, Alliance and Dublin 70½, Bombay 19s. 3d., Commercial 4 p.ct. 77, Croydon maximum dividend 80, 80½, European 5⅜, 5 7/16, Gas Light and Coke 80, 80½, 3½ p.ct. maximum 59½, 4 p.ct. preference 75⅝, Imperial Continental 139¾, Primitiva 11s. 0¾d., 11s. 3d., 11s. 4½d., 11s. 6d., South Metropolitan 91½, 91⅞, 92, South Suburban 96¾, 5 p.ct. debenture 94½. Supplementary prices, Barnet "A" 147.

On Friday, Croydon maximum dividend 81, Gas Light and Coke 80, 80¼, 80½, 3½ p.ct. maximum 59½, 4 p.ct. preference 75⅝, 76½, 3 p.ct. debenture 57, Imperial Continental 140¾, Primitiva 11s. 4½d., 11s. 6d., 11s. 7½d., 4 p.ct. debenture 1911 66¼, 66⅞, South Metropolitan 91½, 91⅞, 92, South Suburban 98. Supplementary prices, Lea Bridge 7 p.ct. debenture 102, Rochester, Chatham, and Gillingham 6 p.ct. preference 97, 97½.

The reduction in the New York rediscount rate to 3½ p.ct. had a favourable influence on the Money Market. This was perhaps more noticeable in the result of the Treasury Bill allotment, the average rate dropping to £4 6s. p.ct.—a reduction of over 1s. 10d. p.ct. Money was comparatively plentiful, and loans over the week-end were at as low as 3½ p.ct.

Movements in the Foreign Exchanges were unimportant. The French rate, which earlier in the week had touched 147, was a little steadier, closing at 145¾. The Belgian spot rate was only slightly affected by the lowering of the Belgian Bank Rate to 7 p.ct., and closed at 137 1/16. Weakness was displayed in the Spanish exchange, which finished at 33.87½. Italian lire hardened to 120.87½. Sterling on New York was higher at 4.86 5/32.

Silver was firmer, though still cheap at 29 7/16d. per oz., and Gold remained nominally 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. and 3½ p.ct.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 23.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 4	5	5	Aldershot 5 p.c. max. *c*	74—77	..	..
222,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—74	..	..
1,551,868	,,	Apl. 1	6½	6½	Alliance & Dublin Ord.	68—71	..	70—70⅞
374,000	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	Oct. 22	1/7⅛	1/7⅛	Bombay, Ltd.	1/6—1/7⅜	+1/16	19/3
170,000	10	Mar. 4	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	12
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	Jan. 7	3	3	Do. 3 p.c. Deb.	55-58	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
214,740	,,	Mar. 18	12	12	Brighton & Hove Orig.	167—172	..	..
244,200	,,	,,	9	9	Do. A Ord.	130—135	..	..
1,287,500	,,	Feb. 18	5	5	Bristol 5 p.c. max.	85—86*a*	..	..
855,000	,,	Mar. 18	8	7	British Ord.	100—105	..	103—104
100,000	,,	Jan. 7	7	7	Do. 7 p.c. Pref.	117—122	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69—74	..	..
100,000	10	Dec. 17	8	6	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Apl. 22	4½	4½	Do. 4½ p.c. Pref.	5½—6½*	−½	..
150,000	Stk.	Jan. 7	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	Feb. 18	6	6	Cardiff Con. Ord.	96—99	..	..
237,860	,,	Jan. 7	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
157,150	,,	Mar. 4	5	6½	Chester 5 p.c. Ord.	87½—92½*b*	..	..
79,185	1	Apl. 22	½/-	½/-	Colombo Ltd. Ord.	24/—26/-*	−1/-	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-*	−1/-	..
1,513,280	Stk.	Mar. 4	5½	5½	Commercial 4 p.c. Cap.	77—82	..	77—80
560,000	,,	,,	5/3¾	5/3¾	Do. 3½ p.c. Cap.	76—81	..	..
475,000	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	55—58	..	..
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	33—38	..	..
200,000	,,	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	..	..
737,150	,,	Mar. 4	6½	6½	Croydon sliding scale	95—98	..	..
403,100	,,	,,	5	5	Do. max. div.	79—82	..	80—81
492,270	,,	Mar. 4	6	9	Derby Con.	107—109*c*	..	..
55,000	,,	Dec. 17	4	4	Do. Deb.	74—76*c*	..	..
209,000	,,	Mar. 4	5	5	East Hull Ord. 5 p.c.	86—89	..	..
50,000	,,	Dec. 17	—	5	Eastbourne 5 p.c. Deb.	93—98	..	..
1,002,180	10	Apl. 1	†6	†4	European, Ltd.	5—6	..	5½—5 7/16
18,788,960	Stk.	Feb. 18	5½	4/17/4	Gas Light & Coke 4 p.c. Ord.	79½—81½	−½	80—81
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	58—61	..	58½—59½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	74—77	..	75⅝—76¼
5,602,620	,,	Dec. 17	3	3	Do. 3 p.c. Con. Deb.	57—60	..	57—58
181,315	,,	—	—	—	Do. 6 p.c. Br'tf'd Rd. Db.	102—104	..	..
130,000	,,	—	10	10	Do. 10 p.c. Bonds.	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 18	6⅝	6⅝	Hastings & St L. 5 p.c. Conv	88—93	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	68—73	..	..
70,000	10	Sept. 24	†10	†10	Hongkong & China, Ltd.	20—21	+½	20⅜—20⅝
86,500	Stk.	Mar. 4	10	10	Hornsey Con. 7 p.c.	..	..	..
1,976,000	,,	Nov. 19	59	10	Imperial Continental Cap.	137—142	..	139—141
226,170	,,	Feb. 4	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235,242	,,	Mar. 18	6½	6½	Lea Bridge 5 p.c. Ord.	95—100	..	..
2,127,340	,,	Feb. 18	5½	5½	Liverpool 5 p.c. Ord.	78½—79½*b*	..	..
600,000	,,	Mar 18	7	7	Do. 7 p.c. Red. Pref.	101½—103½*b*	..	..
165,736	,,	Feb. 18	9	8	Maidstone 5 p.c. Cap.	115—120	..	..
63,480	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 3	†7	†6	Malta & Mediterranean	4½—5	..	..
541,920	Stk.	Nov. 19	†4	†4	Montevideo, Ltd.	73—76	+2½	75—75½
2,061,315	,,	Mar. 4	5	5	Newcastle & Gateshead Con.	72½—72½*d*	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	75—76*d*	..	..
529,705	,,	Dec. 17	3½	3½	Do. 3½ p.c. Deb.	71—73*d*	..	..
15,000	,,	Mar. 4	11½	11½	North Middlesex 10 p.c.	155—160	..	..
91,530	,,	,,	8 5/16	8 5/16	Do. 7 p.c.	112—117	..	..
300,000	Stk.	Dec. 3	7	9	Oriental, Ltd.	98—103	..	..
188,120	,,	Jan. 7	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	110—115	..	..
60,000	50	Mar. 4	14	14	Portsea Island B	90—95	..	..
100,000	50	,,	13	13	Do. C	88—93	..	..
2,289,909	1	—	—	—	Primitiva Ord.	11/0—12/0	+/6	10/3—11/7½
302,600	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	84—86	..	..
600,000	Stk.	Jan. 21	4	4	Do. 4 p.c. Red. Deb. 1911	66—68	..	66¼—66⅞
193,744	,,	Dec. 17	4	4	Do. B. Aires 4 p.c. Rd. Db.	66—68	..	67¼—67½
264,496	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db	66—68	..	..
150,000	10	Mar. 18	6	6	San Paulo 6 p.c. Pref.	7⅛—8	..	..
125,000	50	Jan. 4	5	5	Do. 5 p.c. Red. Deb.	43—46	..	..
270,000	Stk.	Mar. 18	5½	6	Sheffield A	97—99*e**	..	..
419,968	,,	,,	5½	6	Do. B	97—99*e**	..	..
1,047,000	,,	,,	5½	6	Do. C	97—99*e**	..	..
90,000	10	June 11	6	4	South African	5—7	..	..
6,609,895	Stk.	Mar. 4	5	7	South Met. Ord.	91—93	..	91½—92
1,895,445	,,	Jan. 7	3	3	Do. 3 p.c. Deb.	56—59	..	57⅝—58⅞
734,000	,,	Mar. 4	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	102¼—103
91,500	,,	Mar. 4	8½	8½	South Shields Con.	117—119*d*	−4	..
1,187,795	,,	Mar. 4	6½	6½	South Suburban Ord. 5 p.c.	96—99	..	95½—98
368,837	,,	Dec. 17	5	5	Do. 5 p.c. Deb.	94-97	..	94½
647,740	,,	Mar. 18	5	5	South'mpton Ord. 5 p.c. max	77—80	..	..
121,275	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	69—74	..	..
250,000	,,	Mar. 4	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 17	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	102½—103
120,000	,,	Feb. 18	7½	7½	Tottenham District A 5 p.c.	107—112	..	108
882,275	,,	,,	5½	5½	Do. B 3½ p.c.	87—90	..	88
150,000	,,	,,	23/4	5½	Do. 5½ p.c. Pref.	101—103	..	..
181,255	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	74—77	..	..
258,251	,,	Mar. 18	5	5	Tynemouth Con. and New	67-68*d*	..	..
197,294	,,	Mar. 4	6⅝	6⅝	Uxbridge, Maidenhead, & Wycombe 5 p.c.	90—95	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	85—90	..	..
91,800	,,	,,	6⅝	6⅝	Do. 5 p.c. Maidenh'd	87—92	..	..
30,000	,,	Mar. 4	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	123—128	..	..
255,636	,,	,,	7	7	Do. B 3½ p.c.	103—108	..	..
412,450	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	..
352,000	,,	,,	6⅝	6⅝	Wimbledon 5 p.c.	97—102	..	97—98
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.	105—110	..	..
88,416	,,	Jan. 7	3	3	3 p.c. Deb.	55—58	..	..

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